No. 336

JAMAICA

WEATHER REPORT

FOR THE MONTH OF

JANUARY, 1907.

METEOROLOGICAL RESULTS.

The Bar-pressures at all the Stations except the Hill Gardens are reduced to the standards of Kew, 32°, gravity at Lat. 45°., and mean sea-level. The pressure at the Hill Gardens is reduced to the first three standard only. The Thermometers are exposed in Stevenson's Screens; their readings have been corrected for instrumental errors.

The miles of Wind per diem are measured by Robinson's Anemometers, the factor 3 being assumed correct for the small instruments used and for the small velocities measured.

The amount of Cloud is given in tenths of the whole sky; the Lower clouds are for the most part racto-stratus: the Middle clouds, cumulus; and the Upper clouds, cirrus, or cirro-stratus.

Station.	Elevation.	Bar. Pressure.		Temperature.					Extreme Temperature.				
		7 a.m.	3 p.m.	7 a.m.	3 p.m.	Max.	Min.	Range.	Max.	Date.	Min.	Date.	Range.
	ft.	in.	in.	°	°	°	°	°	°		°		
Negril Point Light House	33	30.038	29.975	69.9	81.2	84.8	67.0	17.8	90.9	14	61.0	31	29.9
Castleton Gardens .	496	..	...	65.5	75.9	79.2	65.5	13.7	82	*12	58	1,25	24
Hope Gardens .	668	29.969	29.953	63.2	79.9	83.9	62.6	21.3	88	6	59	28	29
Stony Hill Reformatory .	1,400	...	...	66.5	76.0	83.8	60.7	23.1	90	16, 18	58	4	32
Hill Gardens .	4,907	25.260	25.232	56.8	69.8	65.8	50.2	15.6	69	13, 20	49	*4	20

Station.	Elevation.	Dew Point and Humidity.				Rainfall.	Wind per diem.	Wind: direction (from) and miles per hour.)				Amount of Cloud. Lower, Middle and Upper.					
		7 a.m.		3 p.m.				7 a.m.		3 p.m.		7 a.m.			3 p.m.		
	ft.	°		°		in.	miles		m.	E.	m.	L.	M.	U.	L.	M.	U.
Negril Point Light House	33	64.2	83	67.9	64	0.89	257	N.E.	6.1	N.E.	11.8	1.0	2.4	0.3	1.7	4.1	0.3
Castleton Gardens .	496	64.2	96	67.1	73	10.49	...	...	...	...	...	...	...	...	...	...	...
Hope Gardens .	668	58.2	83	65.2	60	0.14	...	...	...	...	...	...	...	...	...	...	...
Stony Hill Reformatory .	1,400	60.6	81	62.7	63	0.97	...	...	...	...	...	...	...	...	...	...	...
Hill Gardens .	4,907	52.5	74	58.2	96	2.45	...	...	...	...	...	..	...	...	...	...	...

*And on other days.

National Oceanic and Atmospheric Administration

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March 28, 2002

RAINFALL FOR JANUARY, 1907.

THE first four columns contain all the information relating to the Rainfall for the month received for publication up to the date of this report; the last column contains the corresponding Rainfall average for the month, according to tables recently prepared. In obtaining the mean Rainfall for the month from the numbers in the column for the total fall, only those Stations are considered for which the average Rainfall has been also given in the last column, so that the results of these two columns are directly comparable for each Division. These results are reproduced in the Comparative Table at the end of this Rainfall Return, so as to arrive at the mean for the whole Island embracing the four Divisions.

The Northern Division comprises the northern shores from Port Maria to Davis' Cove, including the central part of the Island which forms the Central Sub-Division; the Southern Division comprises the southern shores from Holland Bay to South Negril; the North Eastern and West Central Divisions are the remaining parts of the Island, bounded by the sea and the other Divisions. Their relative areas are as follows:—

North Eastern Division	–	–	25
Northern and Central	–	–	22
West Central	–	–	26
Southern	–	–	27
			100

NORTH-EASTERN DIVISION.	JAN., 1907. Total Fall.	Greatest fall in 24 hours. Amount.	Date.	Days on which 0.01 or more fell.	Average.
	In.	In			In.
Manchioneal	1.79	0.50	25	8	4.65
Ecclesdown	...	...	...	...	...
Bath	1.57	0.65	25	8	6.02
Moore Town	9.15	...	...	...	20.75
Port Antonio	2.10	0.36	31	15	8.83
Fellowship	5.68	1.44	16	24	13.44
Johnson River Bridge	0.92	0.75	25	3	3.16
Shrewsbury	11.86	1.48	31	21	18.86
Cedar Valley, St. Thos	1.14	0.89	24	2	3.96
Hill Gardens	2.45	0.89	15	10	7.14
Buff Bay	8.70	1.20	17	15	9.61
Greenvale	21.39	2.60	21	29	...
Mt. Holstein	14.54	2.01	22	28	14.43
Hardware Gap	...	...	...	...	...
Irish Town		...	...	...	
Annotto Bay	...	...	...	...	...
Stony Hill Reft.	0.97	0.25	8	10	3.42
Castleton Gardens	10.49	1.51	16	19	9.69
Lawrence Tavern	...	...	...	...	...
Water Valley	4.04	0.93	28	17	8.65
Agualta Vale	5.87	1.00	28	16	...
Hampstead	1.44	1.00	17	4	..
Albany Ry. St.	3.29	0.64	28	12	...
Richmond, St. Mary	6.81	1.35	16	18	6.16
Kendal St. Mary	...	...	...	..	...
Gayle, P.W.D.	...	...	...	...	...
Rio Hoe	6.37	1.11	16	17	5.47
Unity Valley	4.67	0.73	16	21	4.84
Moneague	4.75	0.75	16	20	4.19
Union Hill	4.34	0.73	7	10	...
Claremont	...	...	...	...	
Albion	4.81	1.10	17	16	5.21
Avernam Park	7.82	1.44	28	21	7.04
Ballintoy	2.89	0.67	16	17	2.95
Means	5.41	...	...	...	8.02

NORTHERN DIVISION.	JAN., 1907. Total Fall.	Greatest fall in 24 hours. Amount.	Date.	Days on which 0.01 or more fell.	Average.
	In.	In.			In.
Port Maria	1.88	0.27	18	13	6.75
Ocho Rios		..	...	...	
Drax Hall	2.92	1.26	29	6	4.84
Liberty Hill	...	...	...	...	...
St. Ann's Bay	1.97	0.83	18	7	4.96
Richmond Estate	2.17	0.60	18	9	7.18
Llandovery	2.77	1.32	15	5	6.82
Southfield	4.02	1.18	17	11	12.78
Brown's Town	6.61	0.93	16	22	5.33
Hyde Park	1.73	0.60	24	6	2.31
Dry Harbour	2.91	1.61	18	3	3.86
Chewmagna	1.79	0.32	16	15	2.86
Home Castle	5.35	1.20	17	14	5.43
Richmond Pen	3.45	0.75	26	8	3.52
Mahogany Hall	...	...	...	...	...
Brampton Bryan	4.47	0.85	28	12	4.14
Bryan Castle	4.55	0.98	28	18	4.61
Braco	1.42	0.50	18	7	4.17
Arcadia	3.67	1.20	17	12	4.46
Harmony Hall	2.33	0.45	17	15	4.00
Vale Royal	5.00	1.60	17	14	5.01
Colchis Pen	3.60	1.05	26	8	3 19
Swanswick	4.70	0.80	31	15	...
Hyde	3.76	0.80	30	13	4.59
Georgia	3.5	1.10	17	15	5.65
Long Pond	3 28	0.60	16	14	5.89
Hyde Hall	3.27	0.90	16	11	...
Steelfield	4.65	1.25	17	17	4.48
Etingdon	2.48	0.75	17	12	...
Oxford	2.95	1.30	17	9	3.98
Cambridge	3.23	0.50	17	10	4.50
Lottery	4.02	1.07	17	11	4.03
Falmouth P.W.D.	2.45	0.45	17	9	3.55
Holland Pen	3.00	1.12	16	11	2.90
Kent	2.49	1.80	17	4	4.10
Lima	2.50	1 00	16	5	2.76
Content	3.20	2.00	17	8	4.52
Moor Park	2.87	0.65	17	13	5 16
Success	1.85	0.70	28	4	4.00
Cinnamon Hill	1.88	1.03	28	6	3.56
Rose Hall	2.05	1.00	28	7	3.49
Running Gut	1.67	0.68	28	7	3.55
Montego Bay	2.35	0.75	17	9	2.97
Fairfield, St. James	1.05	0.30	3	4	3.20
Round Hill	0.65	0.30	3	3	2.46
Sandy Bay	1.99	0.45	31	8	4.07
Lucea	3.69	0.88	27	12	3.16
Westfield	...	...	...	...	...

Central Sub-Division.	Jan., 1907. Total Fall.	Greatest fall in 24 hours. Amount.	Date.	Days on which 0.01 or more fell.	Average.
	In.	In.			In.
Headworks, Rio Cobre	0.48	0.19	26	7	1.81
Shanton	0.93	0.35	28	8	...
Linstead	1.43	0.25	10	10	2.11
Berkshire Hall	3.14	0.70	16	16	2.54
Point Hill	2.47	...	...	8	2.45
Carew Castle	2.04	0.39	16	8	...
Worthy Park	1.34	0.41	16	6	2.04
Chapelton	0.51	0.25	25	3	2 38
Danks Works	0.41	0.20	25	3	...
Savoy House	0.43	0.15	16	5	2.69
Cave Valley	0.55	0.45	16	2	2.36
Means	2.70	...	...	...	4.11
West Central Division					
Catadupa Ry. St.	5.52	1.88	27	8	...
Baillieston	...	...	...	...	...
Farm Plantation	2.71	1.20	31	4	2.89
Brokenhurst	...	...	...	...	...
Christiana	1.05	0.30	31	9	2.43
Chudleigh	0.96	0.26	12	8	...
Greenvale Ry. St.	...	...	...	...	...
Kendal, Manchester	Nil	Nil	...	...	2.23
Marshalls Pen	...	...	...	...	...
Mandeville, P.W.D	0.80	0.40	25	5	2.45
Carlton, Mandeville	0.67	0.40	25	5	3.12
Fairfield, Manchester	0.65	0.28	31	7	2.9,
Ulster Spring	2.37	1.28	26	7	3.01
Albert Town	1.77	0.60	31	8	...
Low River	1.90	0.75	31	6	...
Troy	1.25	0.85	27	3	...
Windsor Pen, Trel.	...	...	...	...	...
Wallingford	0.55	0.32	25	3	...
Balaclava	0.85	0.31	25	4	1.81
Siloah	1 70	0.50	25	4	2.48
Appleton Estate	2.03	0.47	23	6	...
Maggotty	1.71	0.36	26	8	
Kempshot	2.27	0.67	31	8	4.31
Kew Park	...	...	...	...	...
Hazelymph	1.25	0.30	29	5	2.39
King Gate	1.50	0.22	2	13	4.12
Darliston	1.67	0.72	26	7	3.06
Whithorn	1.83	0.76	12	5	2.33
Great Valley	3.12	2.14	25	5	4.83
Brownsville	2.67	2.03	25	6	4.62
Fontabelle	0.77	0.52	26	2	2.04
Morgan's Bridge	0.92	0.65	26	4	1.89
King's Valley	...	...	...	...	...
King's Vale Police St.	1.15	0.95	24	3	3.64
Means	1.47	...	...	...	2.98

Southern Division.	Jan., 1907. Total Fall.	Greatest fall in 24 hours. Amount.	Date.	Days on which 0.01 or more fell.	Average.
	In.	In.			In.
Morant Point L. H.	0.79	0.12	7	13	4.05
East Prospect	0.62	0.18	25	5	...
Morant Bay	0.70	0.25	19	7	2.49
Easington	0.31	0.20	25	2	1.48
Bull Bay	...	...			...
Gordon Town	...		...	...	...
Hope Gardens	0.14	0.05	25	4	1.71
Mona	...	..	...	...	...
Half-way Tree	..	...	...	...	...
Lunatic Asylum	Nil	Nil	...	...	0.65
Public Works Office	Nil	Nil	...	...	1.05
Plumb Point L. H.	0.01	0.01	7	1	0.81
Ballast Ground	...	...	..	...	...
Spanish Town	0.20	0.20	26	1	1.46
Hog Hole Pen	0.30	0.30	26	1	1.55
Browns Hall	0.83	0.28	15	5	1.88
Old Harbour	0.40	0.40	28	1	1.99
May Pen	0.92	0.63	31	4	1.29
Clarendon Pk. Ry. St.	0.65	0.37	31	3	...
Denbigh	...	...	...	...	...
Amity Hall	...	...	...	...	...
New Yarmouth	0.45	0.20	31	3	1.17
Milk River	0.46	0.25	25	4	...
Victoria Town	1.08	0.75	25	2	1.79
Stone's Hope	0.92	0.47	31	7	2.75
Newport, Manchester	1.93	0.78	25	6	2.41
Alligator Pond	Nil	Nil	...	...	1.37
Potsdam	0.44	0.29	31	4	2.27
Long Hill	...	...	...	...	...
Pepper	0.66	0.50	30	5	2.07
Torrington	...	...	...	...	...
Bethlehem, St. Eliz.	0.80	0.21	22	9	2.74
Santa Cruz	0.39	0.24	24	4	3.03
Pedro Plains	0.67	0.39	31	4	1.87
Black River	1.33	0.51	26	8	1.60
Spring Hill	0.82	0.53	26	4	...
Font Hill	...	...	...	...	...
Peters Ville	2.98	1.37	26	6	2.10
Mount Edgecombe	2.37	1.45	26	4	2.01
Bluefields	1.03	0.83	26	2	3.72
Sweet River	0.54	0.42	31	3	1.97
Windsor, Sav.-la-Mar	0.43	0.39	31	2	1.89
Sav.-la-Mar P.W.D.	0.50	0.30	31	5	1.75
Retreat	...	...	...	...	...
White Hall	...	...	...	...	...
Negril Point L. H.	0.89	0.37	15	5	1.52
Means	0.73	...	...	...	1.94

NOTES.

Comparative Table of Rainfall.

(Based upon the "Average" Stations only.)

	January.	
	1907.	Average.
	In.	In.
North Eastern Division .	5.41	8.02
Northern .	2.70	4.11
West Central .	1.47	2.98
Southern .	0.73	1.94
Means .	2.58	4.26

The Rainfall for January was therefore considerably below the average for the whole Island. The greatest fall, 21.39 inches occurred at Greenvale in the north-eastern division while no rain fell at Kendal Manchester, in the west central division also at the Lunatic Asylum and the Public Works office, Kingston, in the southern division.

Earthquake.

A shock of earthquake of great severity occurred, according to the observations of Mr. J. Soulette of Kingston, at 6 seconds after 3.33 p.m. on Monday, January 14th. The intensity of the shock was greatest along the foreshore of Kingston Harbour and a large proportion of the buildings in Kingston and St. Andrew were either destroyed or damaged. The greatest topographical effects were at Port Royal where about 100 feet of the Point were lowered several feet below sea level. Considerable land slides were occasioned in the Port Royal mountains, but the effects of the earthquake on the face of the country were relatively slight.

Although the shock was felt all over the island, the damage to houses and buildings was practically limited to St. Andrew, lower S. Catherine, western St. Mary and eastern Portland.

The injuries to the submarine cables along the southern shore indicated that a considerable shock had occurred at a depth of one mile and there is reason to believe that the shock originated a few miles to the south-eastward of Kingston Harbour.

The usual succession of after-shocks has been felt, but these have been quite irregular both in frequency and intensity.

In the absence of adequate seismographical instruments it is not possible to give any accurate record of the after-shocks.

These have been recorded as occurring at Chapelton with remarkable frequency and one was experienced during the proceedings of the Legislative Council which also appeared to be of strictly local character.

Although the earthquake shock of the 14th was of relatively insignificant moment so far as the face of the country of Jamaica is concerned, its extraordinary destructive effect on human habitations and on human life in the City of Kingston mark it out as one of the most terrible events in the history of the Island.

H. H. Cousins.

Weather Office,
Govt. Laboratory, Kingston.

No. 337.

THIRD REPORT

ON

EARTHQUAKES IN JAMAICA.

THE GREAT EARTHQUAKE OF JANUARY 14TH, 1907,

AND

THE AFTER SHOCKS

BY

MAXWELL HALL, M.A., F.R.A.S., F.R. Met. S.,
BARRISTER-AT-LAW.

JAMAICA
—GOVERNMENT PRINTING OFFICE, KINGSTON.—
1907.

Government Laboratory, Kingston, Jamaica.

INTRODUCTORY.

The following Report on the Earthquake of the 14th January, by Maxwell Hall, Esq., is published as a special issue of the Weather Report, No. 337, by authority of His Excellency the Governor.

H. H. COUSINS.

REPORT

ON THE

JAMAICA EARTHQUAKE OF JANUARY 14th, 1907.

INTRODUCTION.

Early in January, 1907, there were a number of visitors in Kingston from England, Canada and the United States, there were delegates from the other West Indian Islands and Demerara to a conference on agricultural affairs, and there were a large number of people in Kingston from the country to attend the conference; so that with fine weather on Monday, January 14th, the town assumed its brightest aspect.

At 3.29 p.m. while the conference was sitting, while the visitors were shopping or otherwise amusing themselves, and while the traffic along the streets and the business in the stores were at their height, without a moment's warning, and in the space of 20 seconds, the town for the most part was shaken by an earthquake into a mass of shapeless ruins, causing the immediate death of a thousand people, and injuring as many more, a number of whom have since died.

The cloud of dust which rose from the fallen buildings was so dense that those who escaped could see nothing around them; they could only feel the ground trembling and swaying under their feet.

When the cloud of dust lifted, it was seen that the walls of the houses and stores had for most part fallen across the narrow streets, burying the foot-passengers, the horses and carriages, and here and there an electric car. In other cases, the walls of the stores had fallen inwards, burying buyers and sellers alike.

And before those who had escaped could give effectual aid to those buried but not killed beneath the ruins, and within 10 minutes after the earthquake, fire broke out among the ruins in two or three different places, and made headway rapidly. There was water, but the engines could not move in the blocked thoroughfares; and that night fire made a clean sweep of the ruined business part of Kingston.

At Up-Park Camp near Kingston, not only were the barracks all destroyed, but the hospital there caught fire, and a number of the patients were burnt to death in spite of the efforts made to save them. The coloured troops turned out that night to aid the police in the stemming of the fire in Kingston and the maintenance of order; and for days the work went on of clearing the streets and of burying the dead.

It then gradually dawned upon the community that the subject of earthquakes had been entirely over-looked in Jamaica; the ruins of the more recently built villas showed this very clearly; and the only seismometer in the Island, a relic of the former Weather Service, was broken by the shock so that there was no instrumental record of any kind.

Under these circumstances the following physical notes of the earthquake were made, and I have to thank a large number of correspondents for their valuable contributions of facts on which we may hope to base the future study of Seismology in Jamaica.

MAXWELL HALL.

Chapelton, April 3rd, 1907.

REPORTS FROM KINGSTON AND PORT ROYAL.

THE KINGSTON MEAN TIME OF THE SHOCK AT DIFFERENT PLACES.

Mr. J. A. Soulette, Kingston—Mr. Soulette had a large pendulum clock which he used as a regulator in his business as watchmaker; and in October 1906 he took the error and rate by means of a sextant and artifical horizon. He made the time to be 3 hours 33 minutes.

Mr. Maxwell Hall, Chapelton—Mrs. Hall happened to look at her watch just as the tremors commenced before the great undulations. The watch was subsequently compared with a mean-time chronometer, and the chronometer was taken to the Kempshot Observatory, and its error taken in the usual manner. The time thus deduced was 3 hours 29½ minutes.

Mr. J. S. Brownhill, Negril Point Light-house—Mr. Brownhill has a mean-time chronometer and a sextant, and he obtains time by altitudes of the sun above the sea-horizon. He made the time to be 3 hours 32 minutes.

By adding 5 hours 7 minutes we get the Greenwich mean time of the shock for each place.

DIRECTION AND DURATION OF THE SHOCKS IN KINGSTON.

Mr. J. C. Ford—"I think the surface vibrations were running from east to west; undoubtedly most of the walls and the tops of brick pillars fell either to east or west of their bases. The vertical movement seemed to me to be very considerable, say 6 or 8 inches; and the number of vibrations about 20 per second. The actual duration of the shocks was as far as I could estimate, the preliminary slight shock about 2 seconds, the great shock following immediately about 10 or 12 seconds."

Mr. Joseph Shore—"I was at the Agricultural Conference in the old Mico building in Kingston at the time, and remained there till it was over. There seemed no warning, but a distinct upheaval followed by oscillations from west to east, which made the walls appear like a blur. The wall behind the platform fell outwards towards the north-west; the other walls leant towards the west. The start of the earthquake in Kingston reminded me of the shock felt on board a large steamer when a big wave strikes it full on, just as the steamer is lifted up on it, accompanied by a rushing and riving sound. There seemed to be two shocks with a short moment or two of less intensity. Another shock, but not very severe, occurred a few minutes afterwards when we were in the street; and the ground seemed to tremble for some time after; and I noticed several shocks during the night of the 14th, preceded by distinct rumblings from the northwest. Several minor tremblings occurred now and again. All the gate pillars and buildings that I saw had fallen towards the west."

Mr. Chas. Renwick, A.M.I.C.E.—At the Public Works Office at 3.15 p.m. it was noticed that the air was stifling; and at 3.31 p.m. when Mr. Renwick was in front of the Parade gate in Orange Street waiting for a tramcar he felt a violent trembling under his feet, and then shocks from west to east; he stepped into the paved roadway as a tremendous west to east jerk occurred which threw people down; and the north and south wall behind him fell into the roadway towards the east. He then ran from the cross-roads eastwards, the road moving as though it was a ship's deck in a heaving sea, and gained the northern gate of the Parade Gardens.

Generally speaking the shocks which destroyed Kingston were east and west, throwing down walls running north and south, and killing many people in the streets.

Mr Maxwell Hall——While there can be no doubt as to the correctness of this general conclusion, there was evidence to the east and north of Kingston of a N.W. and S.E. motion; and to the east of Kingston of a N. and S. motion.

Along the South Camp Road which runs more or less N. and S., the garden rails in front of the villas were held in position by brick pillars with ornamental caps; these and the gate pillars, or only their caps, were thrown to the E.

Two miles from Kingston along the Windward Road similar pillars, or their caps, were thrown to the S; the first set showing the E. and W. motion, the second set showing the N. and S. motion.

In almost all cases the caps had not only fallen but also rolled down a bank, so that no information as to the velocity of their projection could be ascertained.

Mr. J. F. Brennan, Public Works Office—"I was at my desk when the earthquake started, and went at once beneath the doorway and stood there the whole time. The greatest horizontal movement was certainly from E. to W; the walls vibrated rapidly—say 5 or 6 times in a second—with an amplitude of about an inch. The vertical component however is another matter. The duration of the shock was 12 seconds I think."

Mr. Charles Lancaster. (The Liverpool Daily Post and Mercury).—"About 3.25 the entire party rose intending to walk through the Myrtle Bank Hotel into the town to make some purchases. We had not left the land end of the pier more than a few yards before the awful sounds of the earthquake began. Looking round, I saw the covered pier totter to its fall, and instantly the ground of the garden over which we were walking heaved up beneath us, causing us to reel and stagger, and fissures in the garden paths and grass appeared, from which sprang upwards

volumes of sea water. The garden was studded with cocoa-nut palms, and to these we clung as we were thrown about. Then the earth wave passed under the hotel in front of us, and the building instantly fell down within a few yards of us.

That night we all slept on the beautiful lawns of the Constant Spring Hotel, and felt the numerous minor earthquake tremors, which continued for nearly twenty hours after the first convulsive shock. We counted sixteen distinct shocks that night."

THE EFFECT OF THE EARTHQUAKE ON STATUES IN AND NEAR KINGSTON.

Mr. F. Cundall. "The statue of Sir Charles Metcalfe at the foot of King Street, turned with its base on its pedestal slightly in the opposite direction to the hands of a watch. The statue of Queen Victoria in the Parade at the other end of King Street, turned with its pedestal on the supporting pedestal some thirty degrees in the same direction : the statue itself travelling to the E. on its pedestal. The statue of Jordon on the east side of the parade, turned with its pedestal on the supporting pedestal some twenty degrees also in the opposite direction to the hands of a watch. The statue of Dupont which faced N.E., fell in an easterly direction ; the pedestal shifting slightly on the supporting pedestal in the opposite direction to the hands of a watch. The statue of Bowerbank hard by, to the north of the parade, shifted with its base on its pedestal about ten degrees in the direction of the hands of a watch. The canopy over the bust of Fiddes in the Parade Gardens collapsed ; the bust and pedestal remaining intact. The five monuments last named are within one hundred yards of one another.

At Halfway Tree about three miles to the north, a heavy granite cross (a monolith on a pedestal) nine feet high, turned on its concrete foundation about fifteen degrees in the direction of the hands of a watch. Another granite monolith also about nine feet high, fell from its pedestal in an easterly direction ; as did three smaller crosses. Three other small crosses fell—one north-easterly, one south-westerly, and one southerly."

SUBSIDENCE IN KINGSTON HARBOUR.

Mr. Charlton Thompson. Harbour Master—"On the 6th February I surveyed the foreshore from the wharves up the northern shores of the harbour to Harbour Head. The soundings off the wharves and up to the eastward of the Lunatic Asylum have not materially altered, but close to the shore from Rockfort Gardens and under the base of the Long Mountains, there is in places considerable subsidence, also at the eastern edge of the Palisadoes, where I got 4 fathoms of water over mangrove bush which had hitherto been above water ; here there are many cracks and fissures in the sand. The soundings further from the shore and through the centre line of the Harbour are practically unaltered."

Mr. Maxwell Hall.—On February 22nd, I went to Harbour Head to see the fissures ; at the Naval Water-pier there were fissures along the edge of the road parallel to the edge of the harbour, the road being 6 or 8 feet above the water in the harbour ; at the quarry an enormous rock had fallen from above and was resting against the quarry in an almost upright position ; and on the Palisadoes one or two hundred yards from the Harbour Head there were furrows in the deep dry sand 20 or 30 yards long, 4 or 5 feet wide, and 3 feet deep. At places it could be seen where the dry sand had poured into the fissures below ; at other places it could be seen where mud and water had been ejected through the fissures and partly filled the furrows. There were several furrows parallel to one another and to the edge of the harbour ; and standing at the water's edge, it was pointed out to me where the subsidence had taken place, and where there was a marked change in the colour of the water showing a marked change in its depth.

The fissures therefore merely followed the contour of the harbour and the subsidences.

Two miles to the east the submarine cable had been broken near its shore end ; but there were two other breaks ; one off the White River, and the other off Belvidere Point.

Five miles to the west there were two magnificent steamers wrecked on the Palisadoes close to Plumb Point Light House. The "Prinzessin Victoria Luise" went ashore in December through some mistake in the navigation ; the "Prinz Waldemar" went ashore within a quarter of a mile of the former vessel on the night of January 16th in consequence of the Light-house and the machinery having been injured by the earthquake so that it was impossible to light the lamp.

PORT ROYAL.

Dr. J. F. Donovan, Health Officer—"The earthquake occurred here about 3.35 p.m. with great force and rapidity, the shock lasting some 18 to 20 seconds. It was not preceded by any warning, either rumbling or minor shocks, so far as I can gather ; it was followed by a succession of five or six minor shocks for over an hour, which have continued at varying intervals up to the present (January 30th 1907.)

The following are jottings from my diary :—

14th. A very severe shock of earthquake took place about 3.35 p.m. ; the shock appeared to come from the south and lasted for over 15 seconds ; there was a distant muffled sound as of a subterraneous explosion, (some thought it resembled the commencement of a thunderstorm) which culminated in a crash-like sound accompanied with violent rocking, shaking, or vibratory motion, and a distinct swaying of buildings, the walls of the greater proportion being badly damaged and fissured, and some rendered uninhabitable. The duration was longer than any shock but one I ever experienced—that was in

Malta in 1888 I think, when one of the islands of the Grecian archipelago was completely wrecked, and some hundreds of people were killed and wounded.

15th. Successive shocks of earthquake during the day and night; slept in hospital compound last night.

16th. Shocks of earthquake of varying intensity about every third or fourth hour, not quite as sharp as yesterday. Felt shock at Lazaretto about 5 p.m.

17th The shocks are decreasing in frequency and force; about one every four or five hours.

18th. A sharp shock about 1.50 a.m. lasting fully 3 to 5 seconds, rumbling and tremors; and two distinct shocks at 8.30 a.m. and 12.30 p.m. Again at 4 p.m.*

I have interviewed officers of the Garrison, non-commissioned officers, a native pilot, several intelligent boatmen, and residents here, and without exception they all declare that they are of opinion that the shocks came from the south, and a few of them consider there is a little westing in the direction. I am of that opinion. The fissures in the earth are decidedly tending in direction to the N. or N.N.E:, except those near the shore or harbour front to which they are more or less parallel, and as you will perceive by the chart I send you the configuration of the harbour front is of a very devious character; the cracks varied in size and depth very much—no doubt due to the proximity of buildings or structures like piers and the harbour frontage as well as to the character of the soil. The character of the fissures was peculiar. There was a uniform tendency to a slight curve, especially marked towards the terminal end to the N. or N.E., which is very naively termed *serpigenous* as applied to the margins of certain forms of ulcers in the human being. Nature has a wonderful aptitude to adopt the circular in structure, force, etc.

In the brick boundary walls of the Garrison, the R. N. Hospital, and Dockyard, the fissures or cracks are horizontal in those walls running more or less N. and S.; but the fissures or cracks are perpendicular in those running more or less E and W. The southern boundary of the Dockyard is a solid limestone wall running more or less E and W.; in it there are some eight fissures or fractures all perpendicular, and two or three pretty good openings; the largest corresponds in direction with a fracture of the two iron rails of the tram-line, as if they were cut by a cold chisel.

When the great shock was over, a considerable quantity of dark, glistening, slimy subterranean mud, from which there was a very foul sulphurous odour, was thrown up with the subsoil water, which, in a few days proportionally as it was acted on by the sun's rays was converted into fine glistening dark French gray coloured sand containing an enormous quantity of mica and the minute debris of sea shells and I think coral debris also.

The old Military Hospital near the Point built on thick brick arched piers sunk bodily into the earth, some of the piers 4 to 5 feet; most of the buildings that were damaged or fell showed traces of fracture, &c. towards the N.; most of the cracks in the cement paths were in the same direction. The two batteries at the Point, Victoria and Nelson, sank several feet into the ground which appeared to have sunk as many feet; there is a varying depth of from 3 to 8 feet of water all over the Point to the S. and E. of the batteries, and also to the harbour side as far as the Torpedo wharf, which has subsided some 3 or 4 feet into deep water.

The light railway has some peculiar features of interest associated with it; in one place it is buckled up like a miniature switch-back railway—sleepers, cement, roadway, and all—some 20 or 30 feet, forming a curve under which an ordinary sized man could walk. At other places there is a sharp curve formed, both lines keeping perfectly parallel, but the rails are curved like an U as if it were done in a blacksmith's forge.

The R. N. Hospital is badly damaged, but will be habitable with some repairs.

I had a personal interview with Mr. Henry Hunt, pilot of Port Royal, who at the time of the Earthquake was sailing in his boat, a sloop of some 5 tons, about two miles to the S.E. of Port Royal. He states that the wind was changeable, sky cloudy, and general appearance of atmosphere such as to cause some anxiety. He and his boat's crew saw to the S. coming in a direction of S.S.W., a sort of half misty cloud over the surface of the water, resembling steam issuing in spray, or a sort of boiling appearance; they felt the boat rock and toss soon after as if she were bumping on the ground. In a few seconds they saw a huge wave strike Gun Cay and completely cover it from view, and almost simultaneously the Point was struck by the wave and obscured from view; a few seconds later a huge cloud of dust was seen to rise from the town, and a black cloud from the coal wharf, as when a shell ricochets over the water; and he and his boat's crew observed the same phenomenon when it struck Kingston.

I may also mention that I heard it stated that a sailor on one of the steamers in the harbour at Kingston happened to be looking in the direction of Port Henderson just before the shock was felt in Kingston, and he saw a "cloud of dust" rising about Port Henderson which travelled up with enormous rapidity in his direction, and then he saw the houses falling in the city."

In the *Gleaner* of the 24th January a correspondent writes:—"At 3.35 a party of us were on the verandah of a barrack-room at Port Royal when without any warning a most peculiar shaking of the building and a rumbling noise was noticed: but as we had had several small earth tremors lately, no one at first was very much alarmed; but as the noise and the shaking increased it was apparent to all that it was time to clear away from any building. The word was passed

* The rest of the shocks up to 30th January, are entered in the general table of Shocks felt.

to "jump for your lives," and at that moment the building collapsed . . . . . During the time the earth tremors were going on the earth in front of the building was opening and closing, and small eruptions of sand and water took place . . . . .

Those who saw the sea immediately after the shock say that it was mountains high, and when one notices the line of sea-weed, &c., it is evident the waves must have been high . . .

Many of the wharves are partly under water, the beach between the sea and the railway outside the Dockyard wall has disappeared, and the lagoon and sea are one."

REPORTS FROM A FEW PLACES IN THE COUNTRY.

HOPE GARDENS.

Hon. W. Fawcett.—"My office is a two-storied wooden building, built into a concrete floor of the verandah. No damage was done to the building itself, and no books, etc, were disturbed on the top floor; but on the basement, the bottles and cabinets on a stand running E. and W. were, many of them, thrown down. Only two or three of all those on the stand running N. and S. were thrown down."

Mr. Wm. Harris.—"My office was in an old time sugar-estate building with stone walls eighteen inches thick. The heavy iron safe on a wooden stand with four legs was moved along the floor three inches from N. E. to S. W. The office desk, a heavy piece of furniture with four feet, was moved nearly three inches from W. to E. In my house a large wardrobe fell from W. to E., but the wall behind it fell from E. to W.; and other walls fell from S. to N.

PORT ROYAL MOUNTAINS.

There was great damage done to buildings, and many lives were lost In the *Gleaner* we read :—"The road between Mavis Bank and Gordon Town was fearfully damaged, chasms being made in several places for long distances, and in other places whole hill-sides slid across the road."

GORDON TOWN.

There were several landslips on the hill-sides caused by the Earthquake; but there were no fissures separating crags from the mountains, and threatening the long straggling village, as subsequently reported in the New York *World.*

BLUE MOUNTAIN VALLEY.

Mr. Wint wrote :—"A low rumbling sound was heard from the north-east; the sound developed as it drew nearer until it sounded as distant thunder or the firing of guns far out at sea." And then came the earthquake.

MORANT POINT. L. H.

Mr. W. H. Boorman.—"The earthquake of the 14th occurred a little before 4 p.m. and lasted, I should think, about 3 minutes. It appeared to work from S. to N. Nothing was thrown down or displaced, and not even a wall was cracked."

PORT ANTONIO.

[*Boston Newspaper.*]—Mr. and Mrs. Sullivan were in a launch in Port Antonio harbour on the afternoon of the earthquake,

"Suddenly the launch reversed ends and the man seemed to lose all control over it," said Mr. Sullivan; "I could not understand until I looked on shore and saw boys running along the hills, staggering, and the trees shaking.

Over the water we could see the waves of heat just like the "heat devils" you see in summer."

BUFF BAY.

A correspondent to the *Daily Telegraph* writes :—"A very severe shock of earthquake was felt here on the 14th instant at about 3.30 p.m. The tremors were very violent, and lasted fully 90 seconds. There was no previous warning of the shock. The day broke fine, but later on the air became heavy and oppressive with no wind. Suddenly there was a loud rumbling noise and then the earthquake followed. Every stone and brick building is either a complete wreck or will have to be pulled down.

Tuesday, 15th—There has been a low rumbling noise this morning. The earth vibrated the whole day accompanied by shocks at frequent intervals, the heaviest being at 4 p.m. The noise apparently comes from the sea."

The writer then gives a list of shocks felt which have been entered in the general table.

Sunday, 20th—"I visited the Race Course between 4.30 and 6 p.m. and still heard the rumbling and felt the vibration which seemed only apparent in this locality.

The list of those killed is as follows :—R. M. Hudson, killed by falling rocks while riding on the road leadingfrom Buff Bay to Orange Bay. Dennis, killed by falling rocks while working in his field at Claverty Cottage."

The sea withdrew some distance from the land.

ENFIELD, ST. MARY.

From a correspondent to the *Daily Telegraph* we learn that a severe shock was felt which completely destroyed the Episcopal Church, greatly damaged the Roman Catholic Church, and smashed the walls, steps and pillars of dwelling houses. Following the first shock there were several lighter ones during the night at intervals of from 15 minutes to one hour. Of these there could not have been less than 30 up to daylight on the 15th. There are several landslides and cracks, the openings in many cases being very large.

ANNOTTO BAY.

Mr. C. H. Roe.—"I am informed that the shock was felt here very severely, yet not a building in the town was injured. The Court-house had three old cracks and these opened a little. The sea receded about 200 ft. falling 20 ft. below its usual level; and came back about the same distance on land, rising 2ft. above its usual level. The recession occurred fully 3 minutes after the shock: and the sea came back with a rush.

The approach to the Annotto Bridge sank about 4 feet, but I am of opinion that was caused by the fact that the approaches are filled in with loose earth.

Several cracks opened along the road between Annotto Bay and Gray's Inn, and water evidently came up in them, leaving a deposit of black mud on the surface."

From a correspondent to the *Gleaner* we learned that the sea dislodged from their pillars about six small houses near the sea front, and moved them further inland.

Mr. A. C. Westmorland.—"Outside the town much damage has been done to buildings constructed of stone generally. Concrete work has stood the shock well. Buff Bay, ten miles to the east of this, mainly composed of stone buildings has been seriously wrecked."

A correspondent to the Hon. John Pringle writes:—"There was no receding of the sea or any other indication of the earthquake before the shock. The shock came with a tremendous roar distinctly from North-east to South-west followed instantly by the shock of tremendous force.

Immediately after the shock the sea receded about 80 to 100 yards going down below its usual level from 10 to 12 feet, and then the wave which was of thick mud came back 6 to 8 feet higher than the usual level of the sea, and then again receded slightly.

The wave passed over the lower portion of Annotto Bay, lifting small houses into the streets; but on the higher land it came up 25 to 30 ft.

The former level of the sea has not been changed in any way that is discernable."

PORT MARIA.

Mr. Ernest H. Kerr—"I did not have the opportunity of seeing the action of the sea myself but my wharfinger told me the next day that the first thing they noticed before the earthquake was that the sea had receded a considerable way out.

They showed me the place on my pier to which it receded, at least 84 feet from the usual tide mark.

This, according to the wharfinger, happened some 3 or 4 minutes before the shock; his attention was drawn to the condition of the sea by one of the captains of our small sloops, and he went out and had a look at it and came back and was going to telephone us when the shock occurred.

According to his idea, the sea took a good quarter of an hour to return to its normal limit.

This account is confirmed by others, who noticed all the near reefs thoroughly bare, and very shortly after they experienced the shock.

I cannot say that I noticed anything peculiar about the weather that morning, except that it was very close."

A heavy roaring sound was heard before the shock, or rather series of shocks, which were of No. V. intensity.

Mr. Chas. H. Roe—"The pier is 84 feet long and the depth of water at the end of it is between 11 and 12 feet; but I understand that the sea receded far beyond the end of the pier. The pier at the Central Wharf is 160 feet long and 16 feet deep at the end, and the sea went fully 40 feet beyond that, so that I think it would be safe in estimating the fall at 20 feet."

CASTLETON GARDENS.

Mr. J. Campbell—"The direction of the earthquake appeared to me here as coming from N.W. to S.E. The shock was very great. Articles were thrown in a S.E. direction."

STONY HILL REFORMATORY.

Mr. Thos. Mair—"I was in Kingston at the time of the great earthquake; but I am of opinion that the shock here travelled from N.W. to S.E. Articles were thrown in all directions; but the bulk of the debris and small articles were thrown to S.E."

CHAPELTON.

Mr. Maxwell Hall—The Court House is on top of a lime-stone hill about 900 feet above sea-level. The earthquake there commenced with a series of tremors which lasted about five seconds, and these were succeeded by large undulations which made the walls sway to and fro irregularly; that is to say, the building did not sway to and fro as a whole.

The undulations lasted about 15 seconds. I did not feel any severe jerks.

At my residence, Trafalgar, a quarter of a mile away, and 200 feet lower down, besides the tremors and undulations there were severe jerks which sent the water out of two basins flying both N. and S., which sent heavy ornaments on a piano flying to the N.N.W., and which sent some fossils on top of a book-case flying N.W.

These articles were thrown along the floor as far as they had been above it, namely 4 feet 6 inches; the velocity of projection was therefore eight or nine feet a second.

At Trafalgar the sound preceding the earthquake is said to have come from the N.E.

Some walls were cracked, but little damage was done. At Suttons and Low Ground in the valley of the Rio Minho, the earthquake was more severely felt than at Trafalgar. These places are two miles to the east of Chapelton.

The Kingston mean-time of the shock at Chapelton was afterwards deduced to be 3 hours 29½ minutes; but the shock must have taken some 15 or 20 seconds to have travelled from the focus near Kingston; so that the time at Kingston would be about 3 hours 29 minutes.

KENT, TRELAWNY.

Mr. H. Jarrett Kerr—"In the house here they say that they heard a rumbling, and then the shock came from E. to W., or the other way about. The ornaments however fell towards the E, and they thought the shock lasted quite a minute."

CINNAMON HILL, ST. JAMES.

Mr. Jos. Shore—"The shock appeared to come from N.E. to S.W., the articles knocked over all lying towards the S. W. The rumbling was said to have come from the north, and the house must have been lifted up, as the rafters extending over verandahs are still an inch or so above the plates; the lifting of the rafters in some places tore off pieces of the wall plates to which they were attached. Since my return several shocks have occurred, but not of any intensity, and I lost count of them. Now and then I have felt tremors of the ground, but these can only be felt when sitting still, as they are so slight. Today (January 24th) at 11.20 a.m. trembling went on for fully 15 minutes here, now and again dying almost away, and again increasing."

In reply to a letter asking for further particulars on this last point, in which it was suggested that these sensations might have been subjective, Mr. Shore wrote on February 1st—

"I can assure you there was no doubt of the trembling having occurred on the 24th as I am not a nervous subject in that way. I called to the other members of the family who were sitting together after breakfast, and they felt it. It began with a slight oscillation, dying down gradually, and rising again and again, and there was plenty of time for all to notice it. I have experienced several such movements since the earthqnake, particularly that of the 28th ultimo at 4.30 a.m. which was something similar only a little more pronounced."

KEMPSHOT OBSERVATORY, ST. JAMES.

Mr. Maxwell Hall—The pier of the transit instrument is of solid mason work, and rests upon solid rock. I found that the level of the pier had been disturbed, so that the west end of the axis was 32″ higher than the east end.

It was reported to me that the earthquake apparently came from S.

KINGS VALLEY PEN, WESTMORELAND.

Mr. L. Maxwell Hall.—"On my return here a week after the earthquake I found George pond so muddy that the settlers could not drink the water."

The pond in question is six acres in extent, and is always full of pure water; it is supposed to be fed by a spring beneath it; and this disturbance at the time of the earthquake shows that the spring has deep and extensive underground connections. It is to be noted that a severe drought commenced in December, 1906, and lasted several months, so that the mud was not due to rain.

METEOROLOGICAL OBSERVATIONS.

Barometer: reduced to all the standards and further corrected for Diurnal variation.

1907.	Hope Gardens.	Negril Point Light House.
	in.	in.
Jan. 13th 7 a.m.	29·953	30·056
" 3 p.m.	30·011	·046
14th 7 a.m.	30·015	·053
" 3 p.m.	30·005	·047
15th 7 a.m.	30·057	·024
" 3 p.m.	30·070	·009
16th 7 a.m.	30·053	30·063

Kingston, South Camp Road.	in.
Jan. 13th 7 p.m.	30·045
" 14th 7 a.m.	30·041
Chapelton, Jan. 14th 5 p.m.	30·046
" 15th 7 a.m.	30·029
" 16th 7 a.m.	30·053

The average height of the barometer for this time of the year, reduced as above, is 29·991.

Wind—Mr. J. R. Scotland sent me the following observations made at No. 5 South Camp Road, Kingston:—

	Miles of Wind.
Jan. 11th 7 a.m. to 12th 7 a.m.	43
12th " " 13th "	46
13th " " 14th "	26

In consequence of the damage to the house and the destruction of the recording apparatus no further readings could be taken.

The stoppage of the wind was confirmed by Mr. H. F. Baker, a tourist, who wrote:—

"The afternoon was still and hot, with brilliant sunshine. The only unusual condition in the weather for some days previously had been a change in the wind, the usual trades having ceased to blow."

Temperatures—

HOPE GARDENS: elevation 600 ft.

1907.	Mean.	7 a.m.	3 p.m.	Max.	Min.	Range.
Jan. 13th	74°·2	63°	87°	88°	61°	27°
14th	73 ·8	66	82	85	64	21
15th	73 ·0	70	80	80	64	16

NEGRIL POINT LIGHT HOUSE: elevation 33 feet.

1907.	Mean.	7 a.m.	3 p.m.	Max.	Min.	Range.
Jan. 13th	75°·3	67°·4	83°·4	85°·8	66°·5	19°·3
14th	77 ·4	71 ·7	82 ·7	90 ·9	66 ·5	24 ·4
15th	78 ·0	73 ·4	81 ·3	86 ·5	72 ·9	13 ·6

NOTES ON THE FOREGOING REPORTS.

ON THE MEANTIME OF THE SHOCK AT KINGSTON.

The velocity of the shock near its origin is unknown: but if we assume it to be 1·5 miles per second, my determination will be 3 hours 29 minutes, Kingston mean time, or 8 hours 36 minutes, Greenwich mean time.

Now Prof. Milne gives certain observed velocities of transmission along chords through the body of the earth connecting different places;* and if we suppose that the Earth consists of a nucleus surrounded by a shell 40 miles thick, the velocity of transmission along the chord through the nucleus is 6 miles a second, but through the shell only 3 miles a second.

We thus get the following table:—

	G. M. T.	INTERVALS.	
	hr. m.	Observed.	Computed.
		min.	min.
Kingston, time of shock	8 36		
Washington, time of arrival	8 38½	2½	5·5
Isle of Wight do.	8 48	12	12·0
Edinburgh do.	9 4	28	12·6

So that the above figures suit only Prof. Milne's instruments at Shide in the Isle of Wight.

ON THE NATURE OF THE SHOCKS.

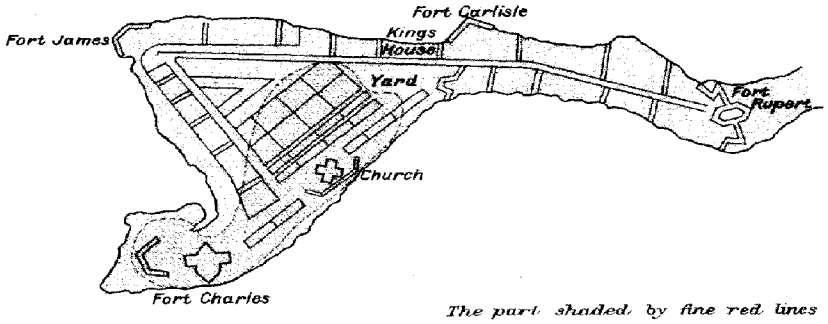
First comes the booming sound, increasing as it approaches the observer; then come quick vibrations of the ground, so that walls vibrate rapidly, several times in a second; among these vibrations occur the violent shocks or jerks, which threw down such things as pillars; and lastly come the undulations or waves in the ground which follow one another every second or two.

In the case of light shocks near the origin we usually have only the sound and the tremors; for shocks of No. II and III intensity, we generally have undulations as well, and the series is often divided by an interval of a few seconds:—the double shocks of the Weather Reports. "The earthquake on the morning of the 12th of August, 1881 afforded a very good example of the double-shock; the first shock was nearly vertical and lasted about one second; after an interval of about three seconds there were several horizontal oscillations which made the houses swing to and fro: and this series lasted about four seconds."†

In the case of shocks from a distant origin we usually have undulations only.‡ The length of these undulations may be very great, so that we can understand the velocity of their propagation; but at Kingston and Chapelton the undulations in 1907 were to be measured in yards—not

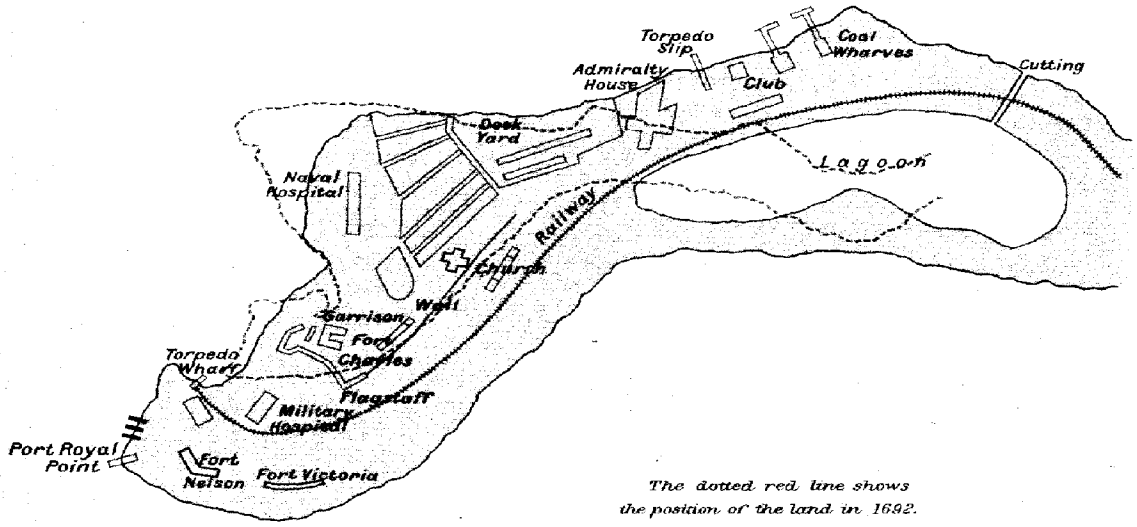
* Earthquakes: 5th Ed., p. 95 d. I have altered the velocities to suit the observations there given.
† Weather Report No. 4, p. 2.
‡ Examples: 1766, June; 1887 Sept. 23, west end of Island; 1907 Feb. 11.

PORT ROYAL *before the Earthquake in 1692.*



The part shaded by fine red lines was left above the sea. the rest was submerged.

PORT ROYAL *before the Earthquake in 1907.*



The dotted red line shows the position of the land in 1692.

Scale of Yards

0 100 200 300 400 500 600 700 800 900 1000

John Bartholomew & Co. Edinr.

miles; and it is difficult to understand how they kept up with the tremors. I used to think that the undulations came from the epicentre while the tremors came from the focus; for there was no reason then to suppose that their length might not be more than 20 yards or so; this was a mistake; but the subject is not yet fully worked out.

ON THE TURNING OF STATUES ON THEIR BASES.

Stones in a roughly built pillar generally rest on one part of their bases more particularly, so that when the pillar receives a lateral shock, the stones are apt to turn round.

In this way the launch in the harbour of Port Antonio was turned round; the part aft and the propeller would have been deep in the water while the bows might have been almost in the air, so that when a lateral thrust came, the boat turned round end for end.

But this rough principle will not apply to properly erected statues; and we must consider the matter more carefully.

Suppose that a shock passes from about WNW to ESE through the base of a monument, whose horizontal section is a square placed N. and S., E. and W.:* then the force of the shock may be resolved into P which tends to tilt the monument on the eastern edge of its base, and Q at right angles to P, which tends to turn the monument round that edge in the direction contrary to the motion of the hands of a watch.

In a moment of time the direction of the shock is reversed, and P now tends to tilt the monument on its western edge, and Q to turn it round as before.

It will thus be found that the directions WNW and NNE, and their opposites, tend to produce rotation as described above; and that the directions ENE and NNW, and their opposites, tend to produce rotation in the opposite direction.

The more oscillating shocks there are from any of these directions, and the more they tilt the monument without overthrowing it, the more likely is the monument to turn on its base.

But on the other hand if the direction of the shocks be from N., NE., E, SE, or their opposites, there will be no tendency to turn the monument on its base.

Consequently the statues of Queen Victoria, Metcalfe, and Jordon, experienced shocks from WNW or NNE or both; and the statues of Dupont and Bowerbank experienced shocks from ENE or NNW or both, so that within a small space the direction of the shocks varied by 45° —a difference which occurred within the limits of my house at Chapelton.

ON THE TREMBLING OF THE GROUND.

Immediately after the severe shocks which destroyed Kingston, a large number of small shocks were felt there, and a distinct trembling of the ground; during the night sixteen shocks were counted, but no doubt there were many more. The register of the after-shocks commences with 7 hr. 5 m. p.m. on the 14th as that shock was of sufficient strength to reach Chapelton.

But while the after shocks occurred at intervals of a few hours, I am informed by several persons that the trembling of the ground was more or less continuous in Kingston for a week or so after the earthquake.

Again, on January 24th at Cinnamon Hill in St. James, trembling of the ground went on for fifteen minutes: and I am informed that near Chapelton trembling of the ground was felt for an hour or so every now and then.

Now while the earthquake was due to an explosion, or to the falling in of a part of the crust of the earth, some miles below its surface, and while the after shocks were due to the settling-down of the crust after its great disturbance, I think that the trembling of the ground should be referred to the balance maintained between the weight of the crust pressing downwards and an elastic force pressing upwards.

It will be convenient to consider that this elastic pressure is due to steam, and thereby correlate earthquake with volcanic phenomena; for indeed this trembling of the ground always occurs when the steam below a volcano is forcing up the lava before an eruption.

Now while in the case of an earthquake we can lay aside all consideration of eruption, we should carefully consider the upward pressure and its variation and the corresponding elevation and depression of the surface of the earth. This will explain several earthquake phenomena; and by considering that a balance is maintained, much smaller forces may upset that balance and produce effects that would otherwise be quite impossible.

THE MAP OF PORT ROYAL.

The chart sent me by Dr. Donovan was a most useful sketch of Port Royal at the present time. The plan given above of Port Royal in 1692 was taken from an old work, and was drawn to the scale of the plan of Port Royal in 1907, which was taken from the Admiralty Chart with a few touches by Captain A. D. Carden, R.E.

It is Captain Carden's opinion that the extension of the land southwards since 1692 has been gradual, and merely due to the accumulation of sand.

No doubt this is quite true; but as the water is 10 fathoms deep close to the edge of this sand-bank, it would appear to be somewhat unstable ground on which to erect batteries; and

* For simplicity: the principle remains however the base may be placed. This theory was proved by some small experiments.

during the recent earthquake a strip of land 50 to 60 yards wide has sunk between the Point and the lagoon along the southern shore; and the lagoon now has a wide opening into the sea on its southern side.

NOTES ON THE METEOROLOGICAL OBSERVATIONS.

In my first Report on Earthquakes, August 30th, 1881 (W. R. No. 4) I wrote, "It thus appears that in some cases two small atmospheric waves pass over Kingston about the time of an earthquake: that the first wave passes about 8 hours before the shock: that the second wave passes about 16 hours after the shock; and that the shock itself takes place during the small depression separating them."

The two waves were well marked at the Hope Gardens near Kingston; the first passed on the 14th at 7 a.m., or 8 hours before the shock, and the second passed on the 15 at 3 p.m., or 24 hours after the shock; and the depression at the time of the shock is much larger than occurs at the time of the small shocks usually experienced in Jamaica.

In my second Report on Earthquakes, March 2nd, 1887 (W. R. No. 77), I gave the following table deduced from 26 small earthquake shocks:—

	in.
Barometer:—24 hrs. before shock	30.009
16 " " "	·013
8 " " "	·015
At time of shock	·008
8 hrs. after shock	·011
16 " " "	·011
24 " " "	30·007

In the same Report the following is the result for Wind:—

Day before shock	89 miles
Day of shock	77 "
Day after shock	87 "

And it is satisfactory to know that at the time of the great earthquake, the usual wind ceased to blow the day before, and that it continued close and oppressive during the day in question, thereby confirming the previous work.

Temperatures are not affected by the shocks, and we must seek elsewhere an explanation for the high maximum at Negril Point on January 14th.

THE INTENSITY AND THE REPORTED DIRECTION OF THE SHOCK AT DIFFERENT PLACES IN JAMAICA, AND MAP.

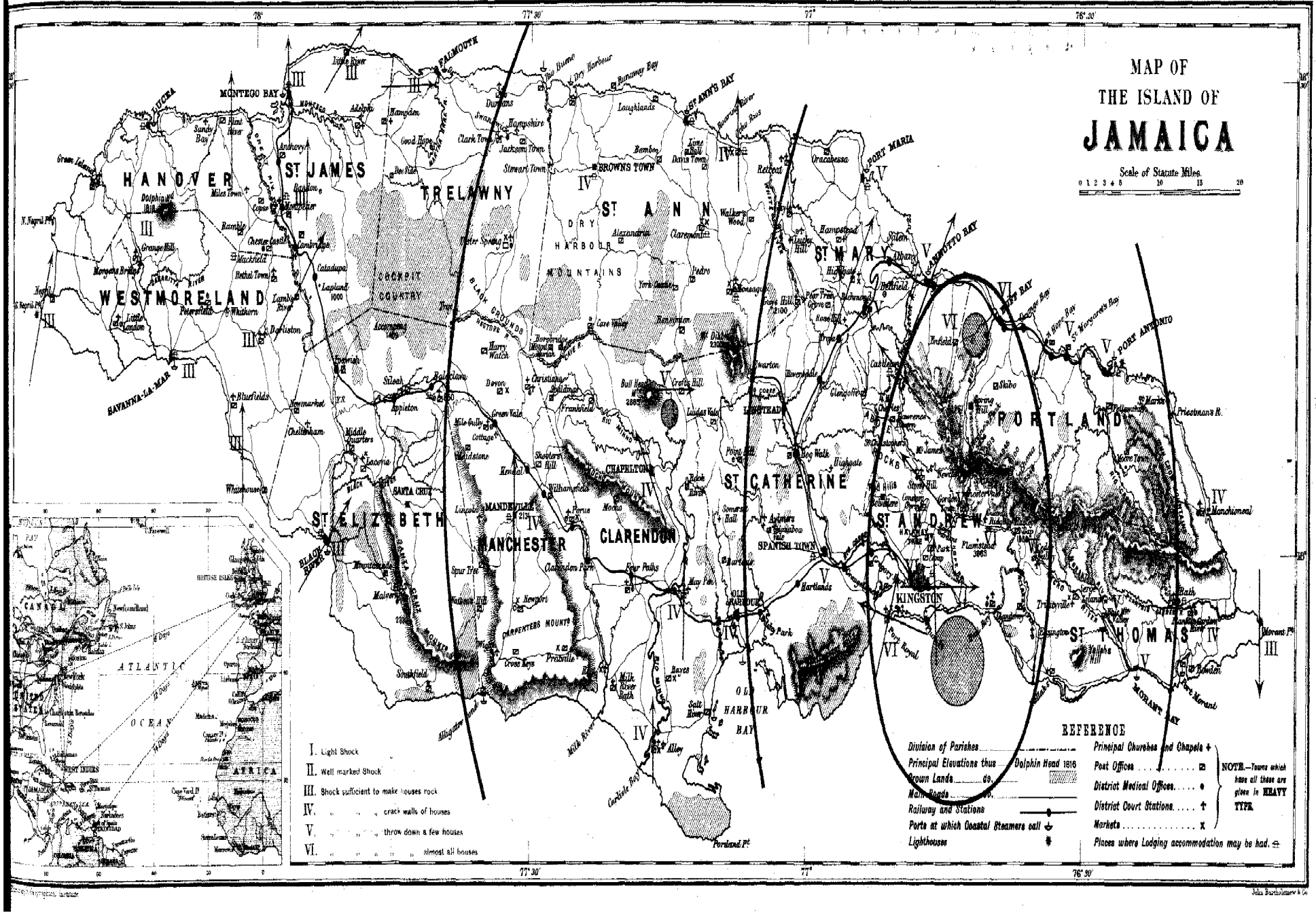
Earthquake scale adopted.

I. Light shock.
II. Well marked shock.
III. Shock sufficient to make houses rock.
IV. " " " crack walls of houses.
V. " " " throw down a few houses.
VI. " " " " " almost all houses.

1907, January, 14th.

Place.	Intensity of shock.	Direction of shock.
Alley ...	IV	S. to N.
Annotto Bay ...	V	N. E. to S. W.
Black River ...	III	S. W. to N. E.
Blue Mt. Valley ...	V	Sound from N.E.
Brown's Town ...	IV	
Buff Bay ...	VI	
Castleton ...	V	N.W. to S.E. articles fell S.E.
Chapelton ...	IV	N.N.W. and S.S.E. sound from N.N.E.
Cinnamon Hill, St. James	III	N.E. to S.W.
Crofts Hill ...	V	W. to E: sound from W.
Darliston ...	III	Double shock
Enfield ...	VI	
Falmouth ...	III	Double shock.
Gayle ...	V	
Gordon Town ...	VI	
Great Valley, Hanover ...	III	N. to S.
Hagley Gap ...	VI	
Highgate ...	V	N.E. to S.W.
Hope Gardens ...	VI	N.E. and S.W. and E. and W.
Kempshot Obs. ...	III	S. to N.

MAP ILLUSTRATING THE EARTHQUAKE OF 1907, JANUARY 14TH



1907, January, 14th.

Place.	Intensity of shock.	Direction of shock.
Kent, Trelawny ...	III	E. and W. articles fell E.
Kingston ...	VI	E. and W. and N. and S. double shock
King's Valley, Westmoreland	III	
Lambs River ...	III	N.E: to S.W.
Linstead ...	V	
Manchioneal ...	IV	
Mandeville ...	IV	S. to N. double shock
May Pen ...	IV	N. and S.
Montego Bay ...	III	S. to N. E. to W.?
Morant Bay ...	V	
Morant Point Light House	III	S. to N.
Mount Edgecombe ...	III	S. to N.
Negril Point Light House	III	S.S.W. to N.N.E.
Ocho Rios ...	IV	S. to N.
Old Harbour ...	IV	
Plantain Garden River	IV	
Port Antonio ...	V	
Port Maria ...	V	
Port Royal ...	VI	S.S.W. to N.N.E.
Port Royal Mts. ...	VI	
Richmond ...	V	
Savanna-la-Mar ...	III	
Shortwood, St. Andrew	...	N. and S.
Spanish Town ...	V	N. and S.
St. Ann's Bay ...	IV	Sound from N.E.
St. Margarets Bay ...	V	
Stony Hill ...	...	N.W. to S.E.

MAP OF JAMAICA ILLUSTRATING THE EARTHQUAKE OF 1907 JANUARY 14.

With reference to the adopted Earthquake scale, shocks Nos. I. II. and III. can be inferred with considerable accuracy; but Nos. IV., V. and VI. depend on the nature of the buildings themselves; so like all other scales, the Wind scale for instance, there is inaccuracy among the higher numbers.

But such scales are of great use, and by means of this one the varying effect of the earthquake over Jamaica can be seen on the map at a glance.

From the middle of area No. VI. to the middle of belt No. V. there are about 22 miles; to the middle of belt No. IV. about 44 miles; to the middle of belt No. III. about 88 miles: and thus we find that the shock would have been described as No. II. at a distance of 176 miles, and as No. I. at a distance of 352 miles. At Guantanamo, a distance of about 175 miles, it really was felt as a well marked shock, or No. II.

From the focus below the surface of the earth the shocks are transmitted in all directions with great velocity—say one or two miles a second. The shocks are caused by vibrations of two kinds; those similar to the vibrations of Sound along the radius, or line joining the focus and any place; and those similar to the vibrations of Light at right angles to the radius. And it appears from the researches of Professor Milne and others that a place on the surface of the earth may be subject to both vibrations simultaneously, or in succession.

Now Kingston was very near the epicentre, or place immediately above the focus, and Kingston experienced the two sets of shocks at right angles to each other. The shocks along the radius projected on the surface of the earth were N. and S. and threw down walls towards the N. or towards the S.; the shocks at right angles to the projected radius were E. and W. and threw down walls towards the E. or towards the W.

This action can be very well seen on the Windward Road two miles east of Kingston; the road runs east and west, and the garden pillars, or the caps of the pillars, have all been thrown N. and S. and chiefly towards the S. But on the South Camp Road running north and south, the garden pillars, or their caps, have all been thrown E. and W, and chiefly towards the E.

Several circumstances agree in placing the epicentre a few miles south of the Palisadoes between Plumb Point L.H. and Harbour Head. The breaking of the submarine cable at Bull Bay, the breaking of the tramway lines at Port Royal, the long and deep fissures in the sand of the Palisadoes near Harbour Head, and the sinking of the ground there as much as 24 feet below the sea-level, agree with the curve marking the No. VI. area, and the considerations from the two sets of shocks just mentioned, in pointing out the position of the epicentre.

The next matter for consideration is that Buff Bay and Enfield on the north side felt No. VI. shocks although they are 25 and 20 miles away, with intervening mountains which would reduce the shocks. And I think there is no doubt that another focus was formed below the geological "fault" in the district of St. George.

The two foci thus account for the oval form of No. VI. area; and the existence of the second focus between Buff Bay and Enfield seems to be proved by the following remarkable circumstances.

Many of my correspondents have reported the direction from which the shocks appeared to them to come; they do not write "N. and S." for instance, but from "S. to N.," as though impressed by a particular vibration from S. to N., and as though they ignored all motion N. to S. Until this be explained I shall consider "S. to N." to be much the same as N. and S. and "E. to W." to be much the same as E. and W.; and so on.

If we now mark down upon the map the reported "directions," giving due weight to the general consensus of opinion in the west of the Island as to "S. to N.," and reversing other directions, we will find that with few exceptions these directions are at right angles, or nearly so, to the lines joining the places with the principal epicentre south of the Palisadoes; and also that the general "motion" is the same way round as the hands of a watch.

Of the exceptions, Annotto Bay, Castleton, and Stony Hill, have all been affected by the second epicentre near Buff Bay according to the rule just laid down.

Two other exceptions are at Crofts Hill and Chapelton; I am assured that the sound and shock at Crofts Hill, or rather Kellits, came from the Bull Head mountain;* and the N. N. W. and S. S. E. direction at Chapelton seems to confirm the existence of a small local focus thereabouts; moreover the sound at Chapelton came from the Bull Head.

The last exception occurs at Kent, a few miles west of Falmouth, which seems to indicate the existence of another small local focus; of which, however, I have no further information.

So that out of the 22 reported "directions," only one is not in accordance with the rule.

And it appears that the vibrations similar to those of Light predominate over those similar to those of Sound; and so much so that at a considerable distance from the epicentre only the former seem to be felt.†

After the great earthquake Mr. J. F. Brennan put in order his seismometer in the old Weather Office; it is of the Gray dead-beat pendulum description of instrument, and his traces of the after-shocks show the existence of two centres, one bearing S. 73° E. of Kingston with an amplitude of 0.010 inch; the other bearing N. 10° E. with an amplitude of 0.004 inch.

The first bearing cuts through Harbour Head, and the second cuts the northern shore between Buff Bay and Annotto Bay;‡ so there can be no doubt that these after-shocks come from the disturbed centres or epicentres, and that the positions of the latter have been fairly well ascertained.

REGISTER OF EATHQUAKES.

A. From 1688 to the commencement of the Weather Service in 1880.
This series is very imperfect.

B. From 1880 to the great earthquake 1907 January 14th.
This series is fairly perfect: and the details of the more considerable shocks will be found in the *Weather Reports*.

C. From 1907 January 14th to July 5th.
Of these after-shocks, a large number were felt in Kingston the evening and night of the 14th of which no record was made.

A.

Year.	Day.	Hour.	Intensity of shock.	Notes: where felt, &c.
		h. min.		
1688	Feb. 19	8. a.m.	I	Three light shocks felt by Dr. Hans Sloane at Spanish Town. They lasted about a minute altogether.
1692	June 7	11.40 a.m.	VI	The great earthquake of Port Royal.
1766	June	11 to 12 p.m.	III	Whole Island: undulation N. to S. Santiago de Cuba destroyed.
1770	June 3	8 p.m.	IV	Whole Island, lasted a minute. Port-au-Prince destroyed.
1771	Sept. 3	—	V	Very severe at Port Royal and Kingston.
1780	Jan. 7	8.10 a.m.	II	Kingston followed by a small undulation 10 minutes after
1780	Jan. 7	10.10 a.m.	I	Kingston
1781	Feb. 17	—	—	Do.
1798	Oct. 4	6 to 7 a.m.	II	Whole Island: two shocks
1799	Jan. 6	1.45 p.m.	II	Do. lasted 30 seconds

* Mr. W. B. Hanman sent a full account to the *Gleaner* at once, but the papers are lost.

† At Washington, north of Jamaica, the east and west vibrations recorded on the seismograph were five times stronger than those north and south.

‡ For further particulars see the Kingston Seismometer among the Additional Notes.

Year.	Day.	Hour.	Intensity of shock.	Notes : where felt, &c.
		h. min.		
1801	Aug. 17	5 a.m.	III	Spanish Town (Lady Nugent)
1802	Sept. 25	10 p.m.	II	Do.
	" 26	1 30 a.m.	II	Do.
	" 30	do. (?)	II	Do.
	Dec. 25	10.30 a.m.	II	Do.
1812	June 23	—	—	Parish of St. George.
	July 6	5.10 a.m.	II	Kingston and adjacent parishes : two shocks.
	Nov. 11	2.30 a.m.	I	
	" 11	5.50 a.m.	IV	Whole Island, eastern part chiefly : three shocks succeeded each other rapidly.
1813	Oct. 15	1.45 p.m.	II	Spanish Town to Montego Bay.
1833	Nov. 8	7. 10 a.m.		
1834	Sept. 7			
1839	July 26	6 a.m.		
	Nov. 5			
1842	May 7	3.15 p.m.	III	Cape Haytien destroyed.
	Aug. 25	5 to 6 p.m.	—	Several shocks.
1843	Mar. 6	3 a.m.		
	" 11	10.30 p.m.	—	Three shocks.
	" 13	4 to 5 a.m.		
	" 20	10 p.m.	III	
	July 2	8 to 9 p.m.		
	" 15	2 p.m.		
1844	Feb. 23	Midnt.		
	May 31	8.30 p.m.	—	Two shocks.
	Oct. 29	6 a.m	—	Montego Bay and Falmouth.
1846	May 27	12 to 1 a.m.		
1852	July 7			
1870	Feb. 3	7 a.m.	I	Gordon Town. (Prof. Houzeau).
1871	Aug. 20	9.23 p.m.	I	Do.
	Oct. 27	9.10 p.m.	I	Do.
	Nov. 5	8.31 p.m	I	Do.
	Dec. 3	9.34 a.m.	I	Do.
	" 9	4.58 p.m.	I	Do. lasted 12 to 15 seconds
1872	Jan. 20	9.40 p.m.	I	Do.
	Aug. 1	7.37 p.m.	I	Do.
	Dec. 7	8 p.m.	II	West end of Island.
1873	Mar. 3	8.31 a.m.	I	Gordon Town, N. to S.: 12 seconds
	June 29	11.46 p.m.	II	Do. NE to SW : 6 "
	Aug. 20	4.4 p.m.	I	Do. NW to SE : 4 "
	Sept. 26	1.39 a.m.	I	Do. NE to SW : 8 "

B.

Year.	Day.	Hour.	Intensity of shocks.	Notes : where felt, etc.
		h. min.		
1880	Feb. 17	11.25 a.m.	I	Kingston, Port Royal Mountains
	July 16	10.25 p.m.	I	Falmouth, Kingston, Buff Bay
	Oct. 15	7.30 am.	I	Kingston
	Dec. 30	11.58 p.m	II	Kingston, Port Antonio, E. Island
1881	Jan. 7	6.25 p.m.	I	Double shocks, Kingston
	" 8	10 a.m.	I	Kingston
	April 21	7.40 a.m,	I	East of Island
	July 4	3.30 p.m.	I	Kingston
	Aug. 12	5.20 a.m.	II	Water rose 18 inches Kingston H. 6 hours after shock
	Aug. 13	7.35 p.m.	I	Kingston
	Sept. 2	7 p.m.	I	Cinchona, Port Royal Mountains
	Dec. 8	6.15 p.m.	I	Montego Bay

Year.	Day.	Hour.	Intensity of shock.	Notes : where felt, &c.
		h. min.		
1882	Feb. 3	2 a.m.	I	Kingston, St. David
	Mar. 2	4.20 a.m.	I	St. Elizabeth, rumbling sounds
	" 15	9.15 p.m.	I	Kingston, Cinchona
	May 5	1.5 a.m.	II	Whole Island
	Sept. 7	3.45 a.m.	II	Whole Island. Shocks at Colon and Panama
	Oct. 15	7.45 a.m.	I	St. David, Abbey
	Dec. 25	9 p.m.	II	St. David's, East
	" 27	1.20 p.m.	I	Kingston, St. David's
1883	Feb. 1	10.27 p.m.	I	Sav.-la-Mar, Haughton Grove
	April 8	11.5 a.m.	I	St. David, Cinchona
	July 26	1 a.m.	I	Kingston
	Nov. 21	8.22 a.m.	I	St. David, P. R. Mountains
1884	Jan. 14	1.15 a.m.	I	Whole Island
	" 14	1.15 p.m.	III	Whole Island, lasted 30 seconds, violent shocks
	" 25	3.45 a.m.	I	East of Island
	" 29	2 p.m.	I	Kingston
	Feb. 24	9.10 a.m.	II	The Abbey, St. David
	Aug. 1	6.30 a.m.	II	P. R. Mountains
	Sept. 6	9.57 p.m.	II	West end of Island
	Nov. 19	12.55 p.m.	I	The Abbey, St. David
	" 20	10.16 p.m.	I	West end of Island
1885	Feb. 28	1.35 a.m.	III	Whole Island, double shocks, sounds
	Aug. 30	7.15 p.m.	III	Whole Island, 23 seconds, double shock
	Oct. 2	8.40 a.m.	II	West end of Island, loud sounds
1886	Jan. 1	9.30 p.m.	II	Whole Island.
	" 16	6.40 a.m.	I	S. W. of Island
	" 20	Midnight	I	P. R. Mountains.
	" 21	11.3 p.m.	I	St. David's, the Abbey.
	" 22	Noon	I	P. R. Mountains.
	Feb. 10	3.50 p.m	II	West of Island.
	" 20	6.50 p.m.	I	Kingston, Port Royal.
	April 18	4.48 a.m.	II	Whole Island, loud sounds.
	May 1	7.7 am.	I	Kingston, P. R. Mountains.
	" 12	1.10 p.m.	I	Kingston.
	" 12	2.10 p.m.	II	East end of Island, Kingston.
	" 14	11.42 a.m.	I	do. do.
	" 28	3.15 p.m.	II	Whole Island.
	June 3	7.7 p.m.	II	Whole Island, lasted 23 seconds
	July 12	3 am.	II	Montego Bay
	Nov. 3	8.1.0 p.m.	I	Blue Mountain district
	" 10	5.15 p.m.	I	West of Island
	" 15	1.20 a.m.	I	Potsdam
	" 15	2.20 a.m.	I	Double shock, Potsdam
1887	April 18	2 a.m.	I	North of Island
	Sept. 23	6.43 a.m.	III	Whole Island, (W. R. No. 86)
	Nov. 11	between 1 and 2 p.m	I	Whole Island
	" 16	4 a.m.	II	Annotto Bay
	" 20	11.30 p.m.	I	St. David, Abbey
1888	Feb. 3	4.40 a.m.	II	Whole Island, loud sounds, 18 seconds
	" 26	9.16 p.m.	III	Whole Island
	March 18	4 a.m.	I	Kingston
	April 14	1 p.m.	II	Whole Island
	" 16	1.44 a.m.	I	S.W. of Island
1889	March 6	7.7 p.m.	II	St. Ann
	" 27	12.45 a.m.	II	Morant Point light-house
	May 15	8 p.m.	II	St. David, the Abbey
	June 21	6.15 p.m.	II	East of Island
	Sept. 7	5 a.m.	I	St. David, Abbey
	" 7	9.13 a.m.	I	Kingston
	" 14	Midnight	I	St. David, Abbey
	Nov. 23	2.35 p.m.	II	West of Island

Year.	Day.	Hour.	Intensity of shocks.	Notes : where felt, &c.
1890	Feb. 22	1.45 p.m.	II	Potsdam
	April 3	11.43 a.m.	I	Kingston
	May 22	2 a.m.	I	East end of Island
	Sept. 13	12.55 a.m.	II	St. David, Abbey, III at Good Hope
	" 19	3.45 p.m.	II	St. David
	Oct. 30	8.15 p.m.	II	Kingston and East of Island
	Nov. 11	1.40 p.m.	I	Shortwood College
	" 11	2.40 p.m.	I	Do. do. and Castleton Gardens
1891	Jan. 7	5 a.m.	I	St. David, Abbey
	" 27	6.30 a.m.	I	Kingston
	" 28	7.30 a.m.	I	St. David, Kingston
	Feb. 16	3 a.m.	I	Kingston
	" 17	2.30 a.m.	I	St. David
	April 27	7.15 a.m.	II	N.W. of Island
	May 20	6.30 a.m.	I	Do.
	Oct. 27	1.40 a.m.	III	Whole Island
	Dec. 17	6.45 a.m.	I	Kingston, Bull Bay
	" 31	2.50 p.m.	I	St. David, the Abbey
1892	April 11	4.30 a.m.	I	Do. do.
	August 9	9.42 p.m.	II	East end of Island
	Sept. 29	5.30 a.m.	I	St. David, the Abbey
	" 29	5.50 p.m.	I	Kingston
	" 29	6.45 p.m.	I	St. David
	Nov. 27	1.25 a.m.	II	Do.
1893	June 2	7.45 p.m.	I	Kingston
	" 4	8.33 a.m.	II	East end of Island
	Dec. 17	4.20 a.m.	I	North west of Island
1894	Feb. 4	9.35 p.m.	I	Windsor Pen, Trelawny
	March 20	1.45 a.m.	I	Do. do.
	July 22	8 p.m.	I	Fontabelle, Westmoreland
	August 19	1.20 a.m.	I	Kingston, P. R. Mountain
	" 31	2.30 a.m.	II	West of Island
	Sept. 21	6.45 p.m.	I	Shortwood
	Nov. 19	5.50 p.m.	II	Mandeville
1895	Feb. 11	5.24 p.m.	I	Shortwood and Albion
	April 14	4.25 a.m.	II	Whole Island
	" 22	3 a.m.	I	Shortwood
	" 28	8 p.m.	I	West of Island
	" 30	4.45 a.m.	I	Whole Island
	Sept. 21	12.25 p.m.	I	West of Island
	" 30	4.25 p.m.	I	Kingston, East of Island
	Oct. 1	Midnight	I	Yallahs Bay
	" 1	3 a.m.	I	Do.
	" 1	3.30 p.m.	I	Do.
	" 2	11.30 p.m.	I	Do.
	" 3	3.15 a.m.	I	St. Ann
	" 7	9 p.m.	I	Yallahs Bay
1896	Jan. 2	6.30 p.m.	I	West of Island
	" 28	10.30 p.m.	III	Whole of Island
	Feb. 12	8.45 p.m.	I	West of Island
	" 16	1.7 p.m.	I	Whole Island
	" 18	2.55 p.m.	II	St. Ann
	July 29	10.45 a.m.	I	Kingston
1897	April 8	5.10 p.m.	I	Kingston, East of Island
	" 12	8.50 p.m.	III	Whole Island
	Nov. 10	9 a.m.	I	Kingston, East of Island
	Dec. 14	8.40 a.m.	I	Do. do.
1898	Jan. 20	6 a.m.	I	Do. do.
	" 22	11.10 p.m.	I	Do. do.
	May 30	3.45 a.m.	I	Do. do.
	July 10	9.55 p.m.	II	North West of Island
	Nov. 25	10 p.m.	I	St. Ann
	Dec. 14	10.35 a.m.	II	West of Island
1899	Jan. 21	9.40 a.m.	II	Kingston, East of Island
	June 14	6 a.m.	II	Whole of Island

Year.	Day.	Hour.	Intensity of shocks.	Notes : where felt, &c.
1900	June 7	7.15 a.m.	I	West of Island
	July 23	1.30 a.m.	II	Whole of Island
	Sept. 11	11.15 a.m.	I	West of Island
	Nov. 6	8.30 a.m.	I	Kingston, East of Island
	" 6	8.50 p.m.	I	Do. do.
	" 14	2.35 p.m.	I	Do. do.
1901	Jan. 11	12.2 p.m.	I	West of Island
	Oct. 13	2.54 p.m.	I	St. Ann, Albion
1902	Feb. 23	6.30 a.m.	I	West end of Island
	July 11	4.50 a.m.	I	St. Ann, Unity Valley
1903	Feb. 5	2.38 p.m.	I	West of Island
	Aug. 2	2 a.m.	I	Little River
	" 3	2.10 a.m.	I	Unity Valley
	" 13	9.5 a.m.	I	South west of Island
	" 16	8.40 a.m.	I	Unity Valley
	Sept. 14	1.30 a.m.	II	North west of Island
	" 19	2.25 p.m.	I	Do. do.
	Nov. 25	10.35 a.m.	I	West of Island
1905	Jan. 27	2.45 p.m.	III	Whole Island
1906	April 13	9.55 p.m.	I	Unity Valley, St. Ann
	June 22	2.30 a.m.	I	North west of Island
	" 22	1.30 p.m.	II	Kingston
	" 22	2 p.m.	II	Do.
	" 26	1.50 p.m.	I	North west of Island
	Nov. 13	10.54 p.m.	III	Kingston
	" 17	3 a.m.	I	Kings Valley, Westmoreland
	" 24	3 a.m.	I	Bluefields do.
	" 25	2.50 a.m.	II	West of Island, double shock
1907	Jan. 14	3.29 p.m.	VI	The great earthquake of Kingston

C.

AFTER-SHOCKS, or shocks felt in Jamaica subsequent to the great Earthquake of 1907 January 14th, 3 h. 29 m. p.m.

1907.	Kingston Meantime.	Intensity of Shock.	Notes: where felt, &c.
	h. m.		
Jan. 14th	7. 5 p.m.	I	Chapelton
	8. 3 "	II	Whole Island
	9. 2 "	I	Chapelton
	10. 0 "	I	Mandeville
	11.15 " *	I	Kingston, Vere
15th	1.40 a.m.	II	Kingston to Mandeville
	3. 0 "	I	Do. do.
	3.30 "	I	Vere
	6. 0 "	I	Do.
	10. 0 "	I	Do.
	11.25 "	I	Do. Two shocks
	11.58 "	II	Whole Island
	4. 2 p.m.	I	Chapelton, Vere, Buff Bay
	4.41 "	I	Do. do. a single wave
	11.29 "	I	Do.
16th	2.55 a.m.	II	Kingston to Mandeville
	11.34 "	II	Do. do.
	4.34 p.m.	II	Do. Chapelton
	9. 0 "	I	Vere, Mandeville
17th	12.15 a.m.	I	Chapelton, Falmouth
	7.50 "	I	Mandeville
	11.30 "	I	Do.
	4.57 p.m.	I	Chapelton
	9.35 "	I	Kingston, Vere
18th	1.30 a.m.	I	Do. Port Royal†
	6. 0 "	I	Mandeville
	6.34 "	I	Vere
	8.30 "	I	Port Royal

* During the night 14th and 15th sixteen shocks were counted in Kingston.
† Lasting about 4 secs.; there were rumblings and tremors.

1907.	Kingston Meantime.	Intensity of Shock.	Notes: where felt, &c.
Jan. 18th	11.30 a.m.	I	Mandeville
	12.30 p.m.	I	Port Royal
	2. 0 "	I	Chapelton
	4. 0 "	I	Port Royal
19th	3. 0 a.m.	I	Mandeville
	5. 9 "	I	Port Royal
	5.30 "	I	Kingston
	9.30 "	I	Do.
	10.50 "	I	Port Royal
	7.30 p.m.	II	Kingston to Mandeville
	9.20 "	I	Vere
	10. 0 "	I	Chapelton
	10.30 "	I	Vere
20th	3.15 a.m.	II	Kingston to Mandeville
	6.22 "	I	Kingston
	12 noon	I	Buff Bay, Bath
20th	2.32 p.m.	II	Kingston, Vere, Chapelton.
	3.30 "	I	Port Royal, Buff Bay.
	4.45 "	I	Do.
	11. 0 "	I	Chapelton.
21st	12.55 "	II	Kingston.
	6. 0 "	I	Vere.
	9.30 "	I	Kingston.
22nd	8. 0 a.m.	I	Do.
	2.15 p.m.	I	Do., Chapelton.*
	2.35 "	III	Whole Island.†
	4.10 "	I	Port Royal.
	9.20 "	I	Kingston, Richmond,
23rd	1. 0 a.m.	I	Kingston, Vere, two shocks.
	4.55 "	I	Do.
	9.23 "	II	Whole Island.
24th	4. 0 a.m.	I	Vere, Mandeville.
	10.45 "	I	Kingston.
	11.20 "	I	Cinnamon Hill‡ St. James.
25th	3.35 p.m.	I	Kingston.
26th	11. 5 a.m.	I	Do.
	1.45 p.m.	I	Do. St. Mary, Mandeville.
27th	9. 0 a.m.	I	Chapelton.
28th	3.40 "	I	Do.
	4.33 "	II	Whole Island, Kingston 5 seconds
28th	8. 0 a.m.	I	Trinity Ville
	10.11 p.m.	I	Chapelton
29th	1. 5 "	I	Kingston : Mandeville
	9.20 "	I	Do Port Royal
	9.40 "	I	Do. do. Vere
	10.15 "	I	Port Royal : light trembling
30th	7.21 a.m.	II	Kingston : Port Royal
	8.20 "	I	Constant Spring
31st	8. 0 p.m.	I	Vere
Feb. 1st	Midnight	I	Stony Hill
2nd	11.55 p.m.	III	Kingston to Mandeville : III in Kingston
3rd	12.5 a.m.	I	Kingston
	2.12 "	I	Do. Chapelton
4th	4. 0 a.m.	I	Stony Hill.
	6. 0 "	I	Do.
	7. 0 "	I	Do.
5th	1.30 "	I	Kingston.
	5.15 "	I	Do.
	10.59 p.m.	II	Eastern half of Island.
6th	2.55 a.m.	I	Chapelton.
	3.25 p.m.	II	Kingston : Stony Hill, two shocks.
	11. "	I	Stony Hill.

* Preliminary light tremors.
† Preliminary light tremors at Chapelton. At Kingston it was III. Two shocks felt in Vere.
‡ There was trembling of the ground which lasted for fully 15 minutes.

1907.	Kingston Meantime.	Intensity of Shock.	Notes: where felt, &c.
Feb. 10th	12.20 a.m.	I	Chapelton.
	2. 0 p.m.	I	Kingston.
11th	12.30 a.m.	III	Whole Island. *
11th	5.30 p.m.	II	Kingston : Great Valley.
17th	9.50 "	I	Do. Chapelton : Moy Hall.
18th	11.55 "	I	Do.
22nd	8.43 a.m.	III	Do. III at Moy Hall.
	6.15 p.m.	I	Do.
26th	5.40 "	I	Chapelton.
	8.45 "	I	Kingston.
27th	11.40 "	I	Do.
28th	7.40 a.m.	I	Do.
Mar. 1st	4.15 "	I	Chapelton.
	5.55 a.m.	I	Kingston.
	12.45 p.m.	I	Do. Chapelton.
	11.45 "	I	Montego Bay : 3 secs.
5th	9.55 "	I	Kingston to Mandeville : Moy Hall.
7th	6.12 a.m.	II	Do. Chapelton : † Mandeville, Moy Hall.
	8. 0 "	I	Spanish Town : May Pen.
8th	4.15 "	I	Chapelton.
9th	5.45 "	I	Do.
11th	1.50 "	I	Kingston.
14th	11. 0 p.m.	I	Do.
17th	6.30 a.m.	I	Chapelton.
	7.45 p.m.	I	Kingston.
19th	6.10 a.m.	I	Kingston : Moy Hall.
20th	11.59 p.m.	I	Kingston.
22nd	6.42 "	III	Kingston : Chapelton : ‡ Mandeville : III at Moy Hall.
23rd	1.37 "	I	Mandeville.
	10.35 "	II	East end of Island.
25th	12.10 a.m.	I	Kingston : Chapelton.
27th	8.55 "	I	May Pen : Moy Hall.
28th	8.30 "	I	Do.
31st	7.10 "	I	Kingston : two shocks : Moy Hall.
Apr. 2nd	5. 0 a.m.	I	Kingston, two shocks.
9th	2.45 "	III	East end of Island ; III. at Kingston, II. at Chapelton, where it lasted 5 or 6 seconds.
	9.30 p.m.	II	Kingston to Mandeville.
11th	6.14 a.m.	I	Chapelton.
12th	11. 0 p.m.	I	Kingston.
13th	7. 8 a.m.	IV	Whole Island ; IV. at Kingston, III. at Chapelton where there were sounds, tremors and undulations.
16th	7. 0 a.m.	I	Kingston.
24th	7.25 p.m.	II	Do. and Spanish Town
25th	4. 0 a.m.	II	Do.
27th	9. 3 p.m.	I	Chapelton
28th	5.10 "	I	Kingston
	7.40 "	I	Do.
May 1st	3.45 "	I	Do.
	8.30 "	I	Do. two light shocks
3rd	11.10 a.m.	I	Do.
	8.52 p.m.	I	Chapelton
10th	7.40 "	I	Kingston
June 13th	1.18 a.m.	III	Kingston and whole Island : IV at Moy Hall
14th	1.30 "	I	King's Valley, Grange Hill, Westmoreland
16th	11.0 "	I	Chapelton ; Savoy
18th	7.30 "	I	Kingston
29th	2.14 p.m.	I	Do. Chapelton
July 1st	5.10 a.m.	I	Do.
5th	2.10 p.m.	I	Chapelton ; 4 small tremors

* At Great Valley, Han. it was III: slow undulations from N.
† Some sound; N.W. to S.E.?
‡ A single undulation. It was strongest at Bull Bay where the motion was nearly vertical and lasted 3 sec. At Easington there was vertical motion for 3 or 4 sec. and then swinging horizontal motion for 6 sec.

NOTES ON THE REGISTER OF EARTHQUAKES.

There appear to be the following seven epochs of the greatest earthquake activity :—

Epoch.		Sun-spot phase.	Epoch.		Sun-spot phase.
1692	...	...	1843	...	1843 Min.
1766	...	1766 Min.	1886	...	1884 Max.
1771	...	1770 Max.	1907	...	1905 Max.
1812	...	1810 Min.			

And it appears that the epochs coincide with a Sun-spot Max. or Min., or that they follow the latter by one or two years.

"M. A. Poey, who examined a catalogue of the earthquakes of Mexico and the Antilles, extending from 1634 to 1870, shows by a table that earthquakes have come in groups, first at the maxima and then at the minima period of sun-spots."*

It therefore becomes advisable to examine the series (B.) In estimating the activity for any year we shall take a No. I shock = 1, a No. II shock = 2, and so on, always doubling.

EARTHQUAKE ACTIVITY FOR EACH YEAR.

Year.	Intensity.			Activity.	Sun-spot phase.
	I.	II.	III.		
1880	3	1	.	5	
1	7	1	.	9	
2	5	3	.	11	
3	4	.	.	4	Max.
4	5	3	1	15	
5	.	1	2	10	
6	12	7		26	
7	3	1	1	9	
8	2	2	1	10	Min.
9	3	5	.	13	
1890	5	3	.	11	
1	8	1	1	14	
2	4	2	.	8	
3	2	1	.	4	Max.
4	5	2	.	9	
5	12	1	.	14	
6	4	1	1	10	
7	3	.	1	7	
8	5	1	.	7	
9	.	2	.	4	
1900	5	1	.	7	Min
1	2	.	.	2	
2	2	.	.	2	
3	6	1	.	8	
4	1	.	.	1	
5	.	.	1	4	Max.
6	5	3	1	15	
7				Large.	
Totals	113	43	10	239	

And it really does seem to be true that a maximum of activity follows a sun-spot maximum or minimum by 2 or 3 years.

(B) EARTHQUAKE ACTIVITY FOR EACH MONTH.

Month.		Intensity.			Activity.	
		I	II	III	Totals.	Per Cent.
Jan.	...	16	2	3	32	13
Feb.	...	12	5	2	30	12½
Mar.	...	4	2	...	8	3
Apr.	...	11	4	1	23	10
May	...	6	4	...	14	6
June	...	4	6	...	16	6½
July	...	6	3	...	12	5
Aug.	...	6	4	1	18	7½
Sept.	...	12	5	1	26	11
Oct.	...	10	1	1	16	6½
Nov.	...	19	5	1	33	14
Dec.	...	7	2	...	11	5
Totals	...	113	43	10	239	100

* Earthquakes: Prof. Milne, p. 265.

There is nothing very striking about these monthly figures; but if we arrange the months according to the season of the year the results are most remarkable:—

			Activity.	
			Totals.	Per Cent.
Mar. Apr. May	Spring	... ...	45	19
June July Aug.	Summer	... ...	46	19
Sept. Oct. Nov.	Autumn	... ...	75	31½
Dec. Jan. Feb.	Winter	... ...	73	30½
			239	100

In considering the Earthquake activity for each hour we shall therefore divide the series (B) into two groups; the first including Spring and Summer, and the second including Autumn and Winter; and we shall keep the series (C) separate at first.

But it will be found that the series (B) aud (C) have for the most part the same features, so that they should really be combined, as has been done in the last columns in each of the following tables:—

EARTHQUAKE ACTIVITY FOR EACH HOUR.

SPRING AND SUMMER.

Hour.*	SERIES B.				SERIES C.†					SERIES B. AND C.	
	I.	II.	III.	Act.	I.	II.	III.	IV.	Act.	Act.	Per Cent.
Midnight	.	.	.	0	3	.	.	.	3	3	2
1 a.m.	2	2	.	6	.	.	.	.	0	6	4
2 "	6	1	.	8	1	1	1	.	7	15	10
3 "	2	2	.	6	.	.	1	.	4	10	6½
4 "	3	1	.	5	2	1	.	.	4	9	6
5 "	3	2	.	7	1	.	.	.	1	8	5
6 "	.	1	.	2	4	1	.	.	6	8	5
7 "	3	2	.	7	3	.	.	1	11	18	11½
8 "	1	.	.	1	1	.	.	.	1	2	1
9 "	2	1	.	4	2	.	.	.	2	6	4
10 "	.	.	.	0	.	.	.	.	0	0	0
11 "	2	.	.	2	2	.	.	.	2	4	3
Noon	2	.	.	2	.	.	.	.	0	2	1
1 p.m.	1	1	.	3	1	.	.	.	1	4	3
2 "	1	3	.	7	1	.	.	.	1	8	5
3 "	.	1	.	2	.	.	.	.	0	2	1
4 "	1	.	.	1	1	.	.	.	1	2	1
5 "	1	.	.	1	1	.	.	.	1	2	1
6 "	.	1	.	2	.	.	.	.	0	2	1
7 "	.	2	1	8	.	1	1	.	6	14	9
8 "	4	1	.	6	3	.	.	.	3	9	6
9 "	1	.	1	5	3	.	.	.	3	8	5
10 "	2	2	.	6	1	1	.	.	3	9	6
11 "	.	.	.	0	2	1	.	.	4	4	3
Totals	37	23	2	91	32	6	3	1	64	155	100

* In the case of half-hours, half an hour was added to the recorded time.

† To June 16th inclusive.

EARTHQUAKE ACTIVITY FOR EACH HOUR.

AUTUMN AND WINTER.

Hour*	SERIES B.				SERIES C.				SERIES B AND C.	
	I.	II.	III.	Act.	I.	II.	III.	Act.	Act.	Per Cent.
Midnight	7	1	.	9	6	.	1	10	19	7
1 a.m.	2	2	.	6	1	.	1	5	11	4
2 "	3	1	2	13	3	1	.	5	18	6½
3 "	6	1	.	8	3	2	.	7	15	5½
4 "	2	2	.	6	4	.	.	4	10	4
5 "	2	1	.	4	3	1	.	5	9	3
6 "	2	.	.	2	3	1	.	5	7	2½
7 "	4	.	1	8	3	1	.	5	13	5
8 "	4	.	.	4	5	.	.	5	9	3
9 "	4	2	.	8	2	2	.	6	14	5
10 "	1	1	.	3	2	.	.	2	5	2
11 "	4	.	.	4	5	.	.	5	9	3
Noon	3	.	.	3	3	2	.	7	10	4
1 p.m.	2	.	1	6	3	.	.	3	9	3
2 "	3	1	.	5	4	.	.	4	9	3
3 "	5	2	1	13	.	2	1	8	21	8
4 "	2	2	.	6	5	.	.	5	11	4
5 "	2	.	.	2	3	1	.	5	7	2½
6 "	3	1	.	5	4	.	.	4	9	3
7 "	4	.	.	4	1	.	.	1	5	2
8 "	2	.	.	2	1	2	.	5	7	2½
9 "	3	1	1	9	6	.	.	6	15	5½
10 "	4	2	.	8	8	.	.	8	16	6
11 "	2	.	2	10	5	1	.	7	17	6
Totals	76	20	8	148	83	16	3	127	275	100

* In the case of half-hours, half an hour was added to the recorded time.

It thus appears that during the Spring and Summer months the activity is above the average at 2, 3, 4, and 7 a.m.; it is then below the average until 7 p.m., excepting a small rise at 2 p.m.; and it is above the average again from 7 to 10 p.m.

And during the Autumn and Winter months the activity is above the average at 2 and 3 a.m., and 7 and 9 a.m. it is then below the average until 9 p.m., excepting a large rise at 3 p.m. and it is above the average again from 9 p.m. till midnight.

Curves may be drawn showing how far the four series agree or disagree among themselves; and remarking that there is a general similarity among them all, we have to stop suddenly at the borders of an unknown domain in science.

MISCELLANEOUS AND ADDITIONAL NOTES.

BOOMING SOUNDS HEARD BEFORE JANUARY 14TH, 1907.

Early in January these sounds were heard at Mandeville and other parts of Manchester, and also in St. Elizabeth: they were heard on several occasions at the same place, and were described as like distant thunder, or the firing of heavy guns. But there was no thunder, and there was no firing of heavy guns; and the sounds were no doubt subterranean.

Such sounds have been heard before in connection with the eruption of Coseguina in 1835, a volcano in Nicaragua 700 miles W. S. W. of Jamaica. But no eruption has been reported of any volcano in Central America.

THE FOUNDATION ON WHICH JAMAICA RESTS.

According to deep-sea soundings there is a submarine ridge which extends from Cape Gracios a Dios on the Mosquito Coast to Jamaica. This ridge is about 2,000 fathoms above the bed of the Caribbean Sea on the south-eastern side of Jamaica, and the Bartlett deep on the northern side; and it is about 800 fathoms below the surface of the sea. From this ridge certain elevations rise; and the tops of these elevations form the Gorda, Rosalind, and Pedro Banks, and the Island of Jamaica.

Jamaica is therefore at the point of a submarine mountain range, jutting out 500 miles from the main land; and the Blue Mountain Peak in Jamaica, the highest point in the range, rises 7,400 feet above the sea-level.

If from the Peak we take a NNW line to the Bartlett deep at a distance of 92 miles, we get a slope of 1 in 16: but if we take a NNE line to the 1,000 fathom soundings at a distance of 30 miles

we get a slope of 1 in 12 or 13. When drawn on paper this slope looks small; but it is really very large from the seismic point of view: and it may be one of the causes of earthquake in Jamaica. But southeast of Jamaica the slope is very much less, and our principal focus near Harbour Head is on the wrong side of the Blue Mountain range according to the slope theory.

The fundamental geological formation consists of porphyritic conglomerate and volcanic tuff in ever varying combination; imbedded in tuff there may be large boulders of hornblende andesite, or only small round pebbles, or there may be only tuff, pure and simple; and in many places the stratification is very imperfect.

This curious combination of water-worn igneous stones with volcanic tuff is stated to be 2,000 to 3,000 feet thick. On it the dark shale series rests here and there; it is composed of much the same materials; but it is of very much finer composition, and it is perfectly stratified. It is also of great thickness.

Above these formations we have a great thickness of limestone, showing that the greater part of the land was submerged for a long period during eocene times, so that only the mountain tops were above sea-level.

And finally we have recent alluvial deposits from the hills and mountains. Kingston is built on such alluvial plain.

A glance at a geological map shows that the lines of strike are for the most part NW. and SE. I believe that they may affect the intensity and direction of earthquake shocks.

THE KINGSTON SEISMOMETER.

After shocks registered by Mr. J. F. Brennan.

Scale.		Horizontal movement.
		in.
I	...	0·004
II	...	0·012
III	...	0·04
IV	...	0·11
V	...	0·33
VI	...	1·0

1907.	Kingston Mean time.	Intensity.	Directions* of movements.	Horizontal movement	Estimated duration.
	hrs. min.		°	in.	sec.
January, 29 ...	1 6 p.m.	I	S 73 E	0·006	2 to 3
" ...	9 20 "	II	S 65 E	·009	"
February 3 ...	12 5 a.m.	I	S 74 E	·002	"
5 ...	10 59 p.m.	II	S 71 E	·010	"
11 ...	12 44 a.m.	I	N 6 E	·007	"
" ...	5 30 p.m.	I	N 5 E	·006	"
17 ...	9 50 "	I	S 66 E	·004	"
18 ...	11 59 "	I	N 46 E	·003	"
22 ...	8 43 a.m.	III	S 70 E	·027	"
" ...	6 15 p.m.	I	N 8 E	·003	"
26 ...	8 45 "	I	N 13 E	·003	"
27 ...	11 40 "	I	N 3 E	·003	"
March 1 ...	5 55 a.m.	I	N 2 W	·002	"
5 ...	9 55 p.m.	I	N 49 E	·007	"
7 ...	6 10 a.m.	I	N 40 E	·007	6
11 ...	1 50 "	I	N 1 W	·003	2 to 3
14 ...	11 0 p.m.	I	N 25 E	·004	"
17 ...	7 45 "	I	N 3 E	·002	"
19 ...	6 10 a.m.	I	N 4 E	·002	"
20 ...	11 59 p.m.	I	N 3 E	·002	"
22 ...	6 41 "	II	S 75 E	·023	4
23 ...	11 0 "	II	N 17 E	·014	6
27 ...	8 56 a.m.	II	S 75 E	·013	3
31 ...	7 10 "	I	N 17 E	·007	"
April 9 ...	2 40 "	II	N 15 E	·023	7
" ...	9 35 p.m.	I	N 3 E	·002	2 to 3
13 ...	7 8 a.m.	IV	S 85 E	·096	5
June 13 ...	1 18 "	III	N 3 W	·035	4
29 ...	2 11 p.m.	I	N 0 E	0.002	½

* Only one direction is given: they should all be similar to "S 73° E, or N 73° W."

Grouping the shocks according to their direction we get the following table :—

	1907.	Kingston mean time.	Direction of movement.	Horizontal movement.	Estimated duration.
		hr. min.	°	in.	sec.
	February 11 ...	12 44 a.m.	N 6 E	0.007	2 to 3
	" ...	5 30 p.m.	N 5 E	.006	"
	22 ...	6 15 "	N 8 E	.003	"
	27 ...	11 40 "	N 3 E	.003	"
	March 17 ...	7 45 "	N 3 E	.002	"
	19 ...	6 10 a.m.	N 4 E	.002	"
	20 ...	11 59 p.m.	N 3 E	.002	"
	April 9 ...	9 35 "	N 3 E	.002	"
	June 29 ...	2 11 "	N 0 E	0.002	½
(1)	1st set ...	...	N 4 E	0.003	2 to 3
(2)	March 14 ...	11 0 p.m.	N 25 E	0.004	2 to 3
	February 18 ...	11 59 p.m.	N 46 E	0.003	2 to 3
	March 5 ...	9 55 "	N 49 E	0.007	"
	7 ...	6 10 a.m.	N 40 E	0.007	6
(3)	3rd set ...	...	N 45 E	0.006	4
(4)	April 13 ...	7 8 a.m.	N 95 E	0.096	5
	Janaury 29 ...	1 6 p.m.	N 107 E	0.006	2 to 3
	" ...	9 20 "	N 115 E	.009	"
	February 3 ...	12 5 a.m.	N 106 E	.002	"
	5 ...	10 59 p.m.	N 109 E	.010	"
	17 ...	9 50 "	N 114 E	.004	"
	22 ...	8 43 a.m.	N 110 E	.027	"
	March 22 ...	6 41 p.m.	N 105 E	.023	4
	27 ...	8 56 a.m.	N 105 E	0.013	3
(5)	5th set ...	...	N 109 E	0.012	3
	March 1 ...	5 55 a.m.	S 2 E	0.002	2 to 3
	11 ...	1 50 "	S 1 E	0.503	"
	June 13 ...	1 18 "	S 3 E	0.035	4
(6)	6th set ...	...	S 2 E	0.013	3
	February 26 ...	8 45 p.m.	S 13 W	0.003	2 to 3
	March 23 ...	11 0 "	S 17 W	.014	6
	31 ...	7 10 a.m.	S 17 W	.007	3
	April 9 ...	2 40 "	S 15 W	0.023	7
(7)	7th set ...	...	S 15 W	0.012	4½

The first set seems to have come from the geological fault on or near the Annotto Bay River which lies N 5° E of Kingston. The Chapelton seismometer gave the direction as N 82°E for the light shock of June 29th ; and this direction cuts that observed in Kingston near this fault. The set is characterized by having been widely felt, over the whole island, or eastern half of the island ; or as strongly felt at Moy Hall, a few miles south of the Blue Mountain Peak, as at Kingston.

The second set, of which there is only one example, refers to the epicentre near Enfield, N 23° E of Kingston.

The third set may have come from the subsidence at Port Royal ; but most likely it came from the geological fault on or near the Spanish River, N 49° E of Kingston. The shocks were felt also at Moy Hall and Chapelton.

The fourth set, of which there is only one example, clearly refers to the subsidence inside the harbour near Rock Fort N 96° E of Kingston. It was IV at Kingston and III at Chapelton.

The fifth set similarly refers to the subsidence inside the harbour near Harbour Head, N 111° E of Kingston.

The sixth set also came from the harbour, south of Kingston. The Chapelton seismometer gave as the direction S 74° E for the shock June 13th, and this direction cuts that observed at Kingston in Kingston harbour.

The seventh and last set also came from the harbour. On April 9th the shock was III. at Kingston, but only II. at Chapelton and the east end of the island: and this apparently places their epicentre near Kingston.

These notes show that the epicentres of the after-shocks are not scattered about indiscriminately; they seem to be confined to faults and subsidences; and it is greatly to be desired that three simple seismometers of the same construction should be placed at suitable stations in the eastern part of the island, and maintained in good working order, so as to afford definite information for the future.

THE SEA OUTSIDE THE PALISADOES AND INSIDE THE HARBOUR.

Mr. W. Kirkpatrick:—"On Tuesday night, Jan. 15th, about 11 p.m. the sea in the vicinity of Bull Bay set up an appalling booming sound which continued until about midnight.

The waves gradually travelled along the front of the Palisadoes and was lost to hearing in the vicinity of Rocky Point.

Since then, after every tremor, no matter how slight, the heavy boom of the rollers can be heard setting in within half-an-hour after the tremor had passed.

On Feb. 12th at 9 a.m. there was an unusual commotion in the harbour; waves were dashing on the shore from a belt of disturbed water, in the middle of the harbour, about half a mile in length.

At a point where the greatest ebullition appeared the depth of the water is about 60 feet. A gentle north breeze was blowing at the time."

THE PORT ROYAL AND ST. ANDREW MOUNTAINS.

Hon. Capt. G. G. Taylor:—"Landslips have occurred on all the new mountain roads blasted out of the hillsides. Along the old riding roads there have been very few slips in the mountains.

"Tradition says that the Great Break at Arntully, and Judgment Cliff at Belle Clare, were caused by the 1692 Earthquake; these dislocations were again increased by the recent Earthquake.

"If from a point in Lat. 17°38′ and Long. 76°42′ three lines be drawn towards Stoddard's Peak, Blue Mt. Peak, and Portland Gap, it will be found that the most damage in this part of the island occurred along these lines. There are large areas between where you would never know there had been an earthquake. West of the first line, I think most of the east and west walls fell, but east of the line right up to Morant Bay, I believe most of the walls facing north and south were destroyed.

"Tradition also says that the Earthquake of 1692 altered the course of the Hope River and the Rio Cobre at Bog Walk, so that if this was the case, greater damage was done to a greater area than in the last. Your oval No. VI. in your map is perfectly accurate as to the damaged area of the 14th Jan. last, and it looks to me as if your oval line No. V. would represent the area of greatest damage according to tradition of the 1692 shock; proving it was much more severe than the last.

"One feature of the after results of the 14th January was that many times we in the mountains have felt the same sensation as you would feel lying in a boat on a river tied to the bank, on a still afternoon, with the boat slowly moving up and down on the slight ripple of the water. In fact as if the whole Island was floating on a sea that was slightly undulating. There was absolute stillness, no noise whatever."*

The following shocks were noticed at Moy Hall only, as far as is known; they were received too late for the general register, or rather for the deductions from the registers:—

1907, Jan. 24th	...	9.30 a.m.
" 29th	...	8.55 p.m.
" 30th	...	5.55 a.m.
" 31st	...	12.30 p.m.
Feb. 4th	...	10.10 p.m.
" 5th	...	7. 5 a.m,
" 11th	...	4. 0 a.m,
" 18th	...	8.20 a.m.
April 27th	...	4.55 p.m.
May 4th	...	1.35 a.m.

THE PHYSIOLOGICAL EFFECTS OF THE EARTHQUAKE.

Many persons spoke of nausea; this was not due to the heaving motion of the ground, but to shock to their nerves; for the nausea continued for some time, kept alive by the after-shocks which were little more than tremors; and in the case of some persons it was known that other causes of shock to the nerves—shipwreck for instance—produced nausea.

*See Physiological effects of the Earthquake.

Many persons felt imaginary swaying of the ground at times for weeks after the occurrence. For instance a person would be quietly reading in an arm chair, when suddenly a swaying motion would apparently begin and last for some seconds.

And lastly, the after-shocks reduced the whole community to an extremely nervous sensitive condition.

THE CONTINUANCE AND CESSATION OF THE AFTER SHOCKS.

On April 13th, a rather severe No. IV shock raised the question as to how long the after-shocks were likely to continue: and Prof. Milne wrote to the *Daily Mail* to the effect that the frequency of the after-shocks should give us the information.

A curve showing the frequency, or rather the activity, was drawn about the end of April, and it showed that the shocks would cease about the end of July. (*Gleaner*, *Daily Telegraph*: May 3rd.)

The shocks then stopped for about four weeks; they began again with a No. III shock on June 13th, and they followed the curve very closely for the next three weeks; so that the curve has apparently proved trustworthy.

The following are the figures employed in the construction of the curve:—

Week.	Intervals.	I.	II.	III.	IV.	Act.
1	January 14 to January 20 inclusive ...	39	9	.	.	57
2	January 21 to January 27 " ...	15	2	1	.	23
3	January 28 to February 3 " ...	12	2	1	.	20
4	February 4 to February 10 " ...	9	2	.	.	13
5	February 11 to February 17 " ...	1	1	1	.	7
6	February 18 to February 24 " ...	2	.	1	.	6
7	February 25 to March 3 " ...	8	.	.	.	8
8	March 4 to March 10 " ...	4	1	.	.	6
9	March 11 to March 17 " ...	4	.	.	.	4
10	March 18 to March 24 " ...	3	1	1	.	9
11	March 25 to March 31 " ...	4	.	.	.	4
12	April 1 to April 7 " ...	1	.	.	.	1
13	April 8 to April 14 " ...	2	1	1	1	16
14	April 15 to April 21 " ...	1	.	.	.	1
15	April 22 to April 28 " ...	2	2	.	.	6
16	April 29 to May 5 " ...	4	.	.	.	4
17	May 6 to May 12 " ...	1	.	.	.	1
18	May 13 to May 19 " ...	.	.	.	.	0
19	May 20 to May 26 " ...	.	.	.	.	0
20	May 27 to June 2 " ...	.	.	.	.	0
21	June 3 to June 9 " ...	.	.	.	.	0
22	June 10 to June 16 " ...	1	1	1	.	7
23	June 17 to June 23 " ...	1	.	.	.	1
24	June 24 to June 30 " ...	1	.	.	.	1
25	July 1 to July 7 " ...	2	.	.	.	2
26	July 8 to July 14 " ...	.	.	.	.	0
27	July 15 to July 21 " ...	.	.	.	.	0

It is to be hoped that there will be a well-marked cessation, so that there can be no doubt as to when the series C stopped, and as to when the series B should be recommenced.

It was shown above that as a rule we may expect about four No. I shocks a year, and about two No. II shocks: while a No. III shock occurs as a rule only once in every two or three years. And it will be very interesting to determine by means of the Seismometers now constructed, or to be constructed, whether the shocks of the series B will come from the same subsidences and faults as those of the concluded series C.